THURSDAY, JULY 27, 1876

THE UNIVERSITY OF MANCHESTER[1]

III.

IN former articles we have come to the conclusion that the higher education of this country ought to be extended, and further, that this cannot be accomplished by an extension of the powers of the present Universities. The question remains how this can most properly be brought about? Let us, in the first place, refer to those projects that have already come before the public in a manner more or less definite. To begin with the American system. This is one of nearly absolute liberty. A number of men agree together to found an educational establishment, and they obtain, without any difficulty, by application to Government, the power of granting degrees. It can hardly, we think, be said that this system has worked so well in America as to encourage the hope that it may solve the educational difficulties of this country. As a rule American degrees are not highly thought of on this side the Atlantic, and we even question whether many of them command much respect on the other side. The cause of this failure is, we think, to be found in the motives which often induce men to combine together with the view of founding an educational institution. In some cases these are of the most praiseworthy character. The inhabitants of a large and influential district, while they, perhaps, differ from one another in their religious views, are yet convinced of the great importance of the higher education, and agree together to found an institution which is truly unsectarian, and which represents those good things upon which they are all agreed. But in other cases the motives of the promoters have reference not so much to the points on which they agree with the rest of the community as to those in which they differ from it; and in consequence, the institution founded partakes of a denominational character to a greater or less extent. In the one case the institution succeeds; the constituency is a large one; they possess sufficient means, and are enabled to command the services of the most eminent men—chosen only with reference to their acquirements. But, in the other case, the institution is a failure; the constituency being a limited body, is not possessed of sufficient means, and the field from which they must select their lecturers is limited by this as well as by religious considerations. They are, however, able to obtain a charter, but their degrees are of very little value.

It cannot be supposed that the British Government will ever consent to the introduction of such a system; this alternative may, therefore, be dismissed, as we see it has been (very summarily in a foot-note) by the promoters of the Owens College scheme.

The second proposal requires discussion because it appears to have commended itself to some of the leading statesmen of this country. It is the scheme for founding one great examining-board or degree-giving body for the entire country to which the various provincial colleges shall be affiliated. This scheme is alluded to in the following terms in the Owens College pamphlet:—

"Without dwelling on the experience of such systems as that till recently obtaining in France, or contrasting its results with those of systems like the German, it may be remarked that a centralisation of this description is at the present time, and must long remain, practically impossible in England, where neither are Oxford and Cambridge likely to surrender their self-government, nor public opinion to require them to do so."

It is probable that a central board of this nature while confining itself to the province of examination might yet require, unless under exceptional circumstances, the previous training implied in a college education. But even then its faults would be those of the present University of London carried out to their logical climax. At the risk of repeating ourselves we shall again state what we believe to be the faults of such an institution.

In the first place we have the paramount power—that of granting degrees possessed by a body which does not take the responsibility of itself imparting or seeing imparted by others a true education in the complete sense of that word. This education may no doubt be imparted by the various colleges, but the degree is given by a body which is virtually ignorant of the previous educational training of its candidates in a moral and social aspect.

In the next place the degree-examinations, as they are unconnected with any previous class examinations, form only a rough test of the amount of knowledge which each candidate can produce. There is absolutely no attempt to test the quality and excellence of the producing power of each candidate. In fine the moral and social training is not tested, and the intellectual training only imperfectly tested by the central board.

Thirdly, and this is a point of the utmost importance, the Calendar of the Central Board must inevitably embody only the best known and most widely diffused results of knowledge—not that which is growing and plastic, but that which has already grown and hardened into shape—the knowledge in fact of a past generation which has become sufficiently well established to be worthy of this species of canonisation. A very powerful inducement is thus offered to the professors of the various colleges to teach their pupils according to this syllabus, and a very powerful discouragement to attempt to alter it. They may be men of great originality and well qualified to extend and amend their respective spheres of knowledge, but they have no inducement to do so—their interest is to adhere to the syllabus as rigidly as a priest of the Church of Rome adheres to the syllabus of the Pope.

It is the old and time-honoured custom of killing off the righteous man of the present age in order the more effectually to garnish the sepulchres of his predecessors. Our readers are well aware that the natural philosophy course has changed its character very greatly of late years, and, that for this we are much indebted to Professors Sir W. Thomson and P. G. Tait. But could these men have done this under the system of a central board? If they had succeeded it must have been, as Galileo succeeded, against the attempt made by the ruling authorities of his day to stop his voice and strangle his originality.

The next proposal is a modification of this. It does not propose that the system of the University of London should swallow up all other systems, the impossibility of this consummation (however desirable in itself) being recognised. It rather proposes that the University of

[1] Continued from p. 246.

London, being a good and desirable thing of which we cannot have enough, should split itself up into two parts —a southern and a northern one—a province of Canterbury and a province of York, and that the various provincial colleges in the north should form members of the great University representing the northern province.

Our reply to this proposal is that believing the University of London to represent an incomplete system we are unwilling to contemplate its universal extension whether this be brought about by the process of absorption or by that of fission.

It is alleged by some who favour this system of grouping colleges together into one University, that a healthy principle of competition is introduced into the teaching departments of the various colleges, and they quote in favour of their views the success of the University of Cambridge in producing eminent mathematicians by this system. We shall here confine ourselves to showing that this supposed analogy is delusive. What the various colleges do, and do extremely well, is to impart a moral and social training to their pupils; but it is well known that in Cambridge the real rivalry as regards mathematical honours is not between the various colleges, but between the various private tutors. The chances are in favour of a certain tutor turning out the next senior wrangler, and accordingly the inmates of the various colleges rush off to this tutor in the hope of gaining the great prize. What this system demonstrates is rather the necessity of a thorough system of tutors in addition to that of professors, in order to secure the high proficiency of a few in any department.

Thus by a species of exhaustion, and by discussing the various alternatives suggested, we come to see that we must look to the various individual provincial colleges to become the future Universities of our country; and the only question that remains is whether Owens College be yet ripe for the change. Let us present the claims of this College to our readers in the language of the pamphlet already alluded to :—

"It remains to inquire whether Owens College may be fairly considered equal to the assumption of such a position, and whether the present period is a suitable one in its history for the College to advance such a claim. The history of the College may in any case be said to have prepared it for a University future. Owens College was founded to provide instruction 'in such branches of learning and science as were then and might be thereafter usually taught in the English Universities,' and it has uniformly sought to pursue a course and maintain a character consistent with this intention on the part of its founder. The support given to it in the district has indisputably been largely given as to an institution desiring to hold an academical level. . . . As to curricula and branches of teaching, the Senate, while unwilling to enter into details, have no hesitation in asserting their opinion that Owens College may, taken as a whole, fairly challenge comparison with any academical institutions of this and with some of other countries. We have here a ready-formed and—in essentials—complete University organisation as regards the Faculties of Arts, Science, and Medicine, together with a newly-formed School of Law. . . . The Faculty of Divinity is indeed absent; but apart from the reasons which, in Owens College as well as elsewhere, have caused its absence, it may be worth observing that the conception of a University by no means involves the necessity that it should possess chairs and grant degrees in all the faculties. This position it would be easy to prove from the history of several Universities of European fame."

This is an era of great educational activity; attempts are being made to reform our great English institutions, and a Commission is at present engaged in discussing the future of the Scotch Universities.

We are convinced that an enlightened government will best complete its efforts in this direction by giving a University Charter to Owens College, not, however, as a last and crowning concession, but rather as the first of a series of concessions, all of which, let us hope, will, when the time is ripe for them, be frankly and graciously made. Let there be no disguising the fact that Owens College is but the eldest of a large and rapidly increasing family, others of whom may, we hope, in the course of time, make their appearance before the state. It may, however, be twenty or thirty years hence before any of the recently established institutions is sufficiently ripe to receive the crowning honour of a University Charter. At present no other college can hope to present similar claims representing something like 500 day students, 800 evening students, and a very large amount of voluntary endowment. This is in truth the work of a generation.

We do not think it probable that any opposition to this movement will arise on the part of the two great English Universities. Their office is rather to lend their distinguished graduates as teachers in these new institutions, and by dint of their own practice and their great influence to see that moral, social, and even physical training are encouraged, as well as training in its merely intellectual aspect. And while they themselves may in the future be probably induced to give a greater prominence to the professorial element than they have yet done, they may in their turn induce the other Universities to encourage the tutorial element to a greater extent. In fine, these two old Universities will, whatever happens, always retain a powerful voice in the educational councils of the nation.

Nor must it be supposed that we advocate the doing away with the University of London, for whatever be the plan adopted there will always be colleges which not having attained to the rank of Universities, must look to that institution as their degree-giving body.

But the function of such an institution is to redress a hardship in the case of pupils rather than to cause and perpetuate a hardship on the part of teachers. The University of London will be heartily welcomed as a channel for imparting a degree that could not othewise be procured, but it ought not to be tolerated as a Procrustean bed for the education of the country. In fine, it was founded as the most available means of redressing a grievance, and for this very reason it is necessarily incomplete.

So long as we continue to progress—so long as colleges multiply and are not yet able to grant degrees,—so long must we retain an institution similar to the present University of London.

AGRICULTURAL WEATHER-WARNINGS IN FRANCE

AN important step has been taken by Le Verrier in the application of meteorology to practical matters by the inauguration of a system of weather-warnings specially designed for the benefit of agriculturists. The

chief features of this system of warnings are briefly sketched in a recent number of the *Bulletin Hebdomadaire* of the Scientific Association of France.

Weather-warnings intended to be useful to the agricultural interest are essentially different from those issued for the benefit of navigation. What sailors require almost exclusively to know is, the force and direction of the wind in approaching storms. On the other hand, what agriculturists require to know is a knowledge of coming rains and of thunderstorms, especially the destructive hail which often accompanies them; whilst the wind, save in rare exceptional cases, little affects them. The ability to foretell rain, the causes of which depend on conditions absolutely different in different parts of France, is unquestionably one of the most intricate problems of science, and therefore demands the closest study, wide knowledge, and sound judgment in working out its successful solution.

When, eighteen years ago, the Paris Observatory, established a system of warnings for the French Marine, the conditions for carrying them out successfully were not known. Now, however, owing to the experience acquired, the observatory is able to issue warnings of so useful a nature, that no serious storm makes its appearance in the Channel, or on the shores of the Bay of Biscay, or of the Mediterranean, which has not previously been announced to the seaports menaced by it. To-day the difficult question of agricultural warnings presents conditions of uncertainty similar to those which warnings for navigation presented in 1858. The present difficulty, therefore, is no reason for doing nothing, but only a reason for greater care and more strenuous exertion. Mistakes will necessarily be made at the first, probably numerous during the first year, seeing that there is still no precise basis on which to rest; they will, however, diminish as experience is acquired, and doubtless the time will by and by come when warnings for agriculture will be attended with a like success as now characterises warnings for navigation.

Agricultural warnings cannot, then, as in the case of warnings for navigation, be issued to the provinces by the Paris Observatory in an absolute form. It is, at this early stage, indispensable that the warnings sent to the chief places of the departments be of a general character to be supplemented and modified by local meteorological experts, who, in doing so, must be guided by their knowledge of the local peculiarities of their particular districts. This mode of procedure will furthermore lead to a thorough examination and a more exact knowledge of the meteorology of France.

The points to be more specially investigated by the departmental Meteorological Commissions at the outset, are these:—1. To follow and investigate the march of the rainfall, not only as regards quantity, but as regards the mode in which it is successively propagated from canton to canton, and from department to department, particularly when, after a season of drought, rainy weather begins to set in. 2. As regards thunderstorms (*orages*), the chief point to be attended to is that information of their first appearance be sent to the chief place of the department in which they occur, which, in its turn, will telegraph the fact to the Paris Observatory, so that the officials here may, in view of the whole circumstances, send timely warnings to those departments which appear to be threatened by the storm. 3. Since little is yet really known of hailstorms, which are often so disastrous to agriculture, it will be necessary to give instant attention to collect such data as may likely lead to some knowledge of the influence of woods, hills, and river-courses on the origin and progress of the hailstorm. 4. In connection with the late frosts of spring, which are productive of such enormous loss to agriculture, the often-alleged effect of smoke in counteracting their blighting influence will be brought to the test of experiment on a large scale, say over the whole extent of a valley. 5. Lastly, warnings relative to inundations cannot but excite the liveliest interest, in consideration of the national disasters of recent years, which might have been to a large extent lessened, if not in many cases averted altogether, if a proper system of such warnings had been in operation. To the civil and mining engineers to whom these warnings have been entrusted, the service of the agricultural warnings will necessarily lend much valuable assistance.

Agricultural weather-warnings began to be issued by the Paris Observatory, on May 1, to the three departments of Vienne, Haute-Vienne, and Puy-de-Dôme, the telegraphic authorities giving the free use of the wires in the transmission of the messages. In order to give a fair trial to this initial experiment the system will be continued daily till October 1, 1876, after which the whole matter will be submitted to a careful reconsideration.

The following example will show the method employed in carrying out the system:—On May 7 the Observatory, to show the general course of the isobarics over Europe, telegraphed that the barometer at 32° and sea-level was 29·607 inches at Palermo, 29·725 at Naples, Florence, Perpignan, and Madrid, 29·922 at Moscow, Berne, Limoges, and Bordeaux, 30·119 at Petersburg, Paris, and Lorient, 30·316 at Helsingfors, Helder, and Greencastle, and 30·512 at Hernösand, and Skudesnes. Attention was further drawn to the fact that pressure was not only high in Sweden, but that it had risen 0·393 inch, and not only low in Sicily, but had fallen 0·196 inch; and that since under this two-fold influence a polar current was flowing over Europe towards the Mediterranean, northern and easterly winds would continue to prevail, bringing with them generally clear skies and, owing to the strong sun-heat, an increase of temperature during the day. This prediction, it is needless to add, was verified by the event.

We most heartily wish every success to this bold and novel system of weather-warnings, designed for the benefit of great national interests. It may be added that it is on a sound practical knowledge of the thunderstorm, considering the term in its widest significance, that the success of these warnings will depend; and it, therefore, is singularly fortunate that in no country has so much well-directed labour and expense been bestowed on the investigation of thunderstorms as in France.

RADCLIFFE'S "VITAL MOTION"

Vital Motion as a Mode of Physical Motion. By Charles Bland Radcliffe, Doctor of Medicine, &c. (London: Macmillan and Co., 1876.)

AS there is a growing conviction of the importance of studying physiology from the side of physics, so we may be led to value more the efforts made in this line

by observers who have for long been content to work on, little cheered by recognition by the great body of physiologists, but finding their reward in honest search after truth.

Among such Dr. Radcliffe has for some years maintained the proposition that the contraction of muscle is not an acquired condition determined by the reaction of a vital property of irritability with certain stimuli, but a natural condition resumed after the removal of an electrical charge by which extension had been previously effected and maintained. In this view, for ideas related to the older terms "vitality" and "contractility," ideas related to electricity and elasticity must be substituted. Again, whereas the electrical phenomena manifested in muscle and nerve have been generally regarded —notably by Du Bois-Reymond—as phenomena of current electricity, Dr. Radcliffe has held that so far as they are functionally important, they are phenomena of static electricity, of charge and discharge.

This contention is once more set before us in the book just published under the title heading this notice, with many new arguments and with several material changes in the interpretation of facts.

In former papers Dr. Radcliffe imagined muscle and nerve to be charged with electricity after the manner of a Leyden jar; the coat (neurilemma or sarcolemma) of each fibre doing the work of a dielectric. Many serious difficulties opposed the acceptance of this notion, and now another, certainly much more accordant with the facts, is substituted. According to this later notion, the condition of each muscular or nervous fibre while alive and at rest is one and the same with that of an electromotive element, such as a Daniell's cell, in the state of open circuit. In the polarity of the electromotive element is found the explanation of the apparent existence of a current running from longitudinal to transverse or cut surface, in mutual repulsions of molecules charged with electricity, the explanation of the lengthening, after contraction, of fibres at rest; in variations of electrical charge, and in hypothetical closures of circuit the explanation of the contraction of muscle, of the return of a perfectly elastic substance to the form from which it had been distorted by the charge. Dr. Radcliffe argues that the instantaneous extra and induced currents set up at the opening and closing of circuits are important agents in discharge, and that such instantaneous currents "may be through inductive interaction greatly intensified and might prove to be very powerful" if they were not in great measure lost by being "short-circuited" within the body. As regards the mode in which circuits may be closed and nerve-muscle discharge caused by the will no clear explanation is set forth, though it is remarked that "there is no difficulty in believing that electricity, the slave of the will in this case, may have been ordered out of the way" and muscular electricity left to its own devices.

This theory of nerve-muscle charge and discharge finds important outcome in the book, having application to inhibition, rhythmical movements, rigor mortis, the influence of artificial electricity on vital motion, the work of the blood in vital motion, and many reactions of disease. The chapters relating to these are all most interesting and full of valuable suggestions, but our space will not allow of any analysis of them. A chapter on the "Electrophysics of Vital Motion" demands however a few remarks. Here are recorded observations on the electrical condition of living protoplasm, and here are made inductions to the following effect: (1) that there are no more indications of intrinsic development of electricity in vessels containing living protoplasm, of amœbæ and the like, than in vessels containing distilled water; (2) that living and lifeless bodies are equally under the sway of an electrical potential which varies from hour to hour, so that they are differently charged from hour to hour; (3) that charge will produce expansion which will be greater in aëriform bodies than in bodies which are fluid like water, and greater in these latter than in bodies which are of the nature of solids; (4) that the expansions will operate unequally in bodies which (like amœbæ) are made up unequally of portions which are more or less solid, and portions which are more or less liquid.

Amœboid movements are therefore, "as far as their electrophysics are concerned," the results of variations of electric potential. The parenthesis is important in freeing the author from the charge of forgetting that there may be other forces at work. Granting even that "electric potential" may mean the sum of the operation of a number of cosmical influences—of heat, of gravitation, of lunar and planetary perturbations; all extrinsic, all varying at any point from hour to hour—and this is granting a great deal—there are still left to be considered all the intrinsic influences which may affect molecules and determine movement, such as osmose, chemical affinity, colloid dynamis, and the like. Dr. Radcliffe's colligation is as follows: certain movements are observed to take place in small bodies composed of a mixture of semi-fluid protoplasm with more solid matter; it is conceivable that variations of electrical charge may affect these unequally and produce movement; certain variations of electrical potential are going on at the same time and in the same place in which the bits of protoplasm are moving; the bits of protoplasm do not generate or possess independent or original electricity; therefore the movements are probably produced by the variations of charge consequent on the variations of potential. Surely much more than the "hint" which the author finds in the coincidence is necessary for the establishment of wide inductions.

Fortunately the position taken with reference to the "electrophysics" of nerve and muscle rests upon a much firmer ground of observation and inference. The position is worthy of attentive study, and the argument generally commends itself to our acceptance. At least it invites further examination, and offers many possibilities of proof or trial by collateral observation. We may confidently hope to see the original and acute reasoning of the author generally acknowledged, and, better still, justified and amplified by future followers and observers. W. M. O.

FEISTMANTEL ON THE BOHEMIAN COAL BEDS

Studien in Gebiete des Kohlengebirges von Böhmen. Von Mdr. Ottokar Feistmantel. (Prag, 1874.)

AMONG the additions which extended research is every day making to the stock of our geological knowledge, none are perhaps so welcome as those which

enable us to bridge over the gaps and fill in the blanks which are unfortunately at present so numerous in the geological record. The work that has been done in this direction of late on the borderland between the Carboniferous and Permian formations promises before long to be productive of very important results. Even in so small an area as Great Britain the order of events that happened between the depositions of these two groups must have varied very much from place to place, as will appear from the following table, in which some of the more important sections are shown in a condensed form :—

North Staffordshire.	South Yorkshire.	Lancashire.	Cumberland.	Ayrshire.
Permian.	Permian.	Permian.	Permian.	Permian.
Possible Passage. Upper Red * Coal-measures.	Strong Unconformity. Wanting.	Unconformity. Upper Red * Coal-measures.	Unconformity. Wanting.	Unconformity.
	Red Rock of Rotherham.†		Whitehaven Sandstone.†	Red Sandstones.†
Middle Coal-measures.‡‡	Unconformity. Middle Coal-measures.‡‡	Middle Coal-measures.‡‡	Unconformity. Coal-measures.‡	Strong Unconformity. Coal-measures.‡

* With few coals. † With coal plants. ‡ With thick coals.

Whatever be the value of the identifications ventured on in the above table, it serves at least to establish one fact; that, in the interval which it covers, there are at some spots two stratigraphical breaks, at others only one, and at others, perhaps, none at all; for in the North Staffordshire instance it is very likely that we have not a mere case of deceptive conformity, but may be a true passage. There would be nothing strange in this if we were dealing with the equivalent deposits of the whole world, or even of a large continent, but the fact that such a variety of changes went on within so small an area is worth notice, for it shows how variable were the physical conditions of what may be called the Permo-Carboniferous period; suggests to us that its oscillations, important as they are locally, may have been only local; and so paves the way for a favourable reception of any fresh discoveries that point to an absence of any break between these two formations, which are with us for the most part so sharply marked off from one another. And indeed our home experience is quite sufficient to suggest the possibility of such cases turning up; setting aside the North Staffordshire instance, which is not beyond question, the general lithological character of the Upper Coal Measures and their markedly red colour seem to point to a commencement of what may be called Permian conditions before the close of the Carboniferous period, and to establish something of a bond of union between the two formations, in spite of the unconformities which locally separate them. And when we go beyond our home circle we soon meet with cases where a passage from Carboniferous into Permian seems to exist; such, for instance, as those described by Dr. Dawson in Nova Scotia ("Quart. Journ. Geol. Soc." xxx. 209), and by Dr. Toula in Spitzbergen ("Leonhard and Geinitz' Jahrbuch," 1875, p. 225). In the monograph before us, Dr. Feistmantel treats of what he believes to be a similar instance in the coal-fields of Bohemia.

The coal-bearing beds of that country and their associated strata are broken up into a number of detached basins, and the exact correlation of the members of the different patches is, of course, open to some uncertainty; but Dr. Feistmantel thinks he can establish the following general order of succession, and three main sub-divisions :—

C. Red sandstone, with *Araucarites Schrollianus*.
Strata, with Carboniferous plants.
Bituminous shale (Schwarte), with fish; very few indistinct traces of plants.

B. Strata, with Carboniferous plants.
Gas-shale of Nürschaw, fish, and abundance of Carboniferous plants.
Strata of Radovenz, with Carboniferous plants.
Red sandstone, with *Araucarites*, on the north-east Bohemian Basin.

A. Strata, with Carboniferous plants.

Of these sub-divisions, A yields 232 reputed species of plants, of which 101 pass up into B; all are species usually looked upon as Carboniferous. But as we ascend in the measures, there is a gradual decrease in the plant remains, specially among the arborescent forms, which disappear in the Upper Permian, Stigmaria Ficoides alone surviving to the last. The animal remains of A are five in number and rare: they comprise a scorpion and spider, a grasshopper, and two crustaceans; all are confined to the group.

Among the beds of the groups B and C the author lays special stress on the gas-shale of Nürschaw and the Schwarte, the animal remains of which he describes as characteristic Permian forms ("exquisit permische Thierreste"), and he infers from the intercalation of these beds with others containing only Carboniferous plants, that no hard line can be drawn between the Permian and Carboniferous formations. This conclusion, to say the least, rests on somewhat slender evidence; the genera of fish, quoted in his lists, on which we must mainly rely, are only seven in number, and the species are determined in four cases only; of these, one comes from a deposit the Permian age of which may be admitted, some from beds reckoned Permian by some authors and Carboniferous by others, and some genera are common to both formations. Such an amount of evidence can scarcely be accepted as conclusive. There is also a little inconsistency in the

author's final results; after having, to his own satisfaction at least, broken down the old land-marks, he proceeds to establish new ones where, according to his own showing, no hard and fast lines exist; he classes the group C as Lower Permian, A as Carboniferous, and parallels B with the Ottweil beds of the Saarbruck coal-field, which by the way are distinguished by the absence of Permian forms. It is further a matter for regret that so painstaking an observer has so little of the gift of lucid arrangement, and that he indulges so largely in what De Quincey calls the carpet-bag treatment of sentences.

But faults like these will not detract from the real value of the work; when the time comes for a rectification of boundaries on the Permo-Carboniferous frontier, the vast mass of carefully-observed facts which it furnishes will form no unimportant contribution to the body of evidence by which the question must be decided. The author may have been premature in his conclusions, but his industry and application have produced a work that will have a permanent value. A. H. G.

OUR BOOK SHELF

Holidays in Tyrol—Kufstein, Klobenstein, and Panveggio. By Walter White. (London: Chapman and Hall, 1876.)

THIS volume may be regarded as the complement to that published a good many years ago by Mr. White, "On Foot through Tyrol," in which the Brenner was the eastern limit. The present one takes us to south-east Tyrol, occasionally overstepping the boundary that divides Austria from Italy. Mr. White is a leisurely tourist, with no ambition to rival the feats of an Alpine clubbist, but with what may be called an epicurean taste for scenery of all kinds. It is this taste which keeps him to the lower heights, for from such vantage-ground alone it is found can all the varied features of the Alpine scenery be fully appreciated and enjoyed. The volume contains the results of several summer sojourns in southern Tyrol, and while its main feature is pleasant chat about the principal scenes that are presented throughout its length and breadth, there is much interesting gossip about its towns and villages, their antiquities, history, and, above all, about the people, with all sorts and conditions of whom the author came much into contact. He has the faculty of making himself at home and liked wherever he goes a pleasuring, and thus has learned much about the sentiments and ways of the people that an ordinary tourist would never discover. There is no excitement, no sensation, no hair-breadth 'scapes in the book; the chapters are very short, and the reader will feel no difficulty in laying it down at the end of any one of them; but at the same time Mr. White's pleasant chit-chat never wearies, but keeps the reader in a constant state of placidity and quiet amusement. The region described is out of the way of the ordinary tourist, but we should think Mr. White's volume ought to make it popular. The work will form a useful guide to the Southern Tyrol, and is interspersed with occasional notes on geology, which gives it a claim to be regarded as not altogether unscientific.

Angling Idylls. By G. Christopher Davies. (London: Chapman and Hall, 1876.)

MR. DAVIES is already favourably known to anglers and natural history amateurs, and many lovers of healthful and refreshing reading, by his "Mountain, Meadow, and Mere," and his "Rambles and Adventures of Our School Field Club." The present volume contains a number of charming pictures of country scenes and country life grouped round angling adventures. The Idylls—prose in form we may say—are put together with great art, which seldom makes itself felt, are simply told, and full of the unmistakable freshness of "out-of-doors," to use the author's synonym for Nature. To a jaded mind they will be found almost as refreshing as a day by a river side with rod and line is to a jaded body. Mr. Davies has a good knowledge of natural history, and knows how to observe and tell what he sees, and both the botanist and zoologist will find something to interest them in the book. Under the title of "Angling Acquaintances" he describes graphically the habits of the otter, water-vole, heron, and other animals to be found in the neighbourhood of water, and does the same in another chapter for "Waterside Plants." For lovers of the country and especially of the gentle craft the book possesses many attractions.

LETTERS TO THE EDITOR

The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.]

Extreme Temperature of Summer

ON Saturday, July 15 last, the temperature (in the shade, four feet from the ground) at the Royal Observatory, Greenwich, rose to 93°·0; on Monday, July 17, to 94°·0; and on Saturday, July 22, to 90°·2.

Since the establishment of the Magnetical and Meteorological Observatory in the year 1840, higher readings than 94°·0 have been recorded on two occasions only; 94°·5 in 1858, June 16, which was very early in the year for so high a temperature; and 96°·6 in 1868, July 22.

The following further particulars collected from the Greenwich records may interest some of your readers.

It appears that the temperature has risen to or above 90°, out of thirty-six years, in twelve years only. The annexed list gives the particular days on which such extreme temperature was shown:—

		°			°
1842, Aug.	10	90·5	1868, July	20	90·0
1846, June	20	91·1	,, ,,	21	92·2
,, July	4	91·8	,, ,,	22	96·6
,, ,,	5	93·3	,, ,,	28	90·1
,, ,,	31	91·3	,, Aug.	5	90·5
,, Aug.	1	92·0	,, Sept.	7	92·1
1852, July	5	90·3	1869, July	22	90·9
1857, June	28	92·7	1870, June	22	90·2
1858, ,,	16	94·5	1872, July	25	90·9
1859, July	12	92·5	1874 ,,	9	92·0
,, ,,	13	92·0	,, ,,	20	91·8
,, ,,	18	93·0	1876 ,,	15	93·0
,, Aug.	25	91·3	,, ,,	17	94·0
1868, July	16	92·0	,, ,,	22	90·2

The years 1846 and 1868 were remarkable for high summer temperature; in 1846, 91°·1 was registered as early as June 20, and in 1868 92°·1, as late as Sept. 7.

Throughout the whole period of thirty-six years, the *earliest* summer maximum occurred in 1862, on May 6, and was 81°·5. The *latest* summer maximum occurred in 1875, on Aug. 16, and was 85°·4. The year 1860 was remarkable for depressed temperature; the highest summer reading having been 75°·0 only, on July 17. The year was one which agriculturists will well remember. It was in violent contrast to 1859, as the table above given shows.

Selecting the highest recorded temperature in each year, from 1841 to 1876, with the day of its occurrence, it appears, on the average of the thirty-six years, that the mean of such highest readings is 88°·3, the corresponding mean day of occurrence being July 11. WILLIAM ELLIS

Royal Observatory, Greenwich, July 24

Earthquakes in Samoa

DURING the months of December and January last there was much local seismic disturbance on the north side of the island of Savaii. Loud underground reports were heard in one particular spot near the coast. They were at irregular intervals, but

were sometimes very frequent. I could not ascertain from any of those resident in the neighbourhood the exact number in any definite time, but for several days they must have been almost hourly. The concussion was felt for a distance of four or five miles only around the focus of action; but it was so severe in the nearest village, that the people deserted their homes during its continuance.

On February 1, at 4.30 P.M., we had a very long shock of earthquake, which was felt all over the group. It lasted within a few seconds of two minutes. The oscillation was very great. The islands seemed to be in the hands of Mafui'e (the earthquake god), and he shook us with a vengeance. I took my watch in hand when I felt the first indication of an earthquake, and sat for a minute amidst the clatter of windows, lamp-glasses, and everything movable (a gentleman writing to me about it next day said his house seemed turned into a factory, with the clatter of machinery), but as it appeared to increase in severity, I deemed it prudent to go outside the house. I then noticed that the thatched roof presented the appearance of waves running rapidly across from south to north. After it was over I found two clocks—one facing north, the other south—had been stopped; one facing west was still going. In three parts of my house the plaster at the angles of walls had been broken down. Bottles were thrown down and broken. In my study, books on a shelf facing north were shaken forward; those on shelves running north and south were not affected. The screw of a copying-press, which I had used just before the earthquake, and which was standing up at the time, had been run down. I found by experiment afterwards that it required a vigorous shake with both hands for half a minute to make the screw run down.

Immediately after the earthquake I went to see if there was any oscillation of the sea. There was nothing perceptible on this—the north—side of the island. I have learned, however, from various sources that there was much oscillation on the south side. Directly after the shaking was over the reef was seen to be bare, and fish were lying exposed on it. The natives rushed to secure the fish, and while they were busy picking them up they were overtaken by a wave, which would have proved fatal to many had they not been expert swimmers. I have heard of only one life lost—a child, who was found next day jammed between two masses of growing coral. It was low water at the time, but low-lying villages were flooded by the wave.

During the following night we had four slight shocks of earthquake, but have had nothing severe since.

Upolu, Samoa, April 3 S. J. WHITMEE

P.S.—I wish to correct a misprint in my letter on "The Degeneracy of Man," which appeared in NATURE, vol. xii., p. 47. In speaking of the language of the Polynesians, I said there are many refinements, a large proportion of which are *un*known to most of the present generation. *Unknown* is, however, printed *known*, and thus the point of the illustration is lost.

Fauna and Flora of New Guinea and the Pacific Islands

I HAVE just read, with very great interest, some anthropological and zoological notes on a trip up the "Fly River" in New Guinea, by Signor D'Albertis. From these notes it appears that the "heaps of dung" which have been supposed to indicate the presence of a rhinoceros in the island, are probably the excrement of the Casuarius. Signor D'Albertis also reduces the "tracks of buffaloes" to those of wild hogs; and the fabulous bird "with a spread of wings of 16 feet" (which, in a former letter, I conjectured might have been a Casuarius, with proportionately large wings added by the imagination of the explorers under the influence of excitement), turns out to be nothing more than a *Bucaros ruficollis* with a spread of wings of "4 or 5 feet."

We have, therefore, no reason for modifying our views as to the relation which the fauna of New Guinea bears to the rest of the world. Signor D'Albertis mentions a few examples only of the New Guinea flora, but some of these are specifically identical with common South Pacific Island plants.

In connection with this subject, it may be interesting to some of your readers to know that I have just entered into an arrangement with a Danish botanical collector—Mr. Fritz Jensen—under which he will start from Samoa during the present month on a voyage through the Union, Ellice, and Gilbert Islands (Atolls), to collect for me in botany and zoology. On his return to Samoa in July, he will accompany me to the Loyalty Islands, where he will make a stay of four or five weeks collecting chiefly in botany. At the close of that period Mr. Jensen will proceed to the south-east coast of New Guinea (I have some hope of accompanying him), where he will spend about two months collecting.

Mr. Jensen has been residing with me for several months working at the Samoan flora, of which I have about 700 species in my collection. By the time he completes his trip I hope the collection will be of some value as material towards the preparation of a Flora of the Pacific Islands. S. J. WHITMEE

Samoa, April 3

Optical Phenomenon

I BEG leave to send you a brief account of a striking atmospheric phenomenon which was visible in this neighbourhood on the evening of the 27th ult. Hoping that some of your usual correspondents from the North of Ireland would have sent you a notice of it before this, I delayed writing to you (see vol. xiv. p. 231).

The phenomenon consisted of a pillar of light which rose vertically from the horizon, over the spot where the sun, then set, presumably was at the time, and reached an altitude of some 8°, or perhaps more. I first saw it about 8.45 P.M., when the sun was set about a quarter of an hour, but it was, no doubt, visible earlier, probably before sunset. As the sun moved under the horizon towards the north, the pillar moved in the same direction, still retaining its vertical position, but becoming gradually lower, until at last it disappeared about 9.40 P.M., the sun being then about 6° 30′ below the horizon. The breadth of the pillar was equal to the apparent diameter of the sun. Its colour when first seen was a pale yellow, which as time advanced changed to a golden yellow, and finally to a deep red. The pillar was brighter near the horizon than at a greater altitude, and its upper end was not well defined, but gradually faded away. My son, who was with me, observed that the edges of the pillar were slightly scolloped. The sun had been clear and very hot during the day, but there was a cool air from the north-east, which became colder towards sunset. I have heard that this phenomenon was also visible at Portadown and Tynan, in the County Armagh, and at Aughnacloy in this county.

I presume there can be no doubt that the pillar consisted of a succession of images of the sun overlapping one another, but it is not easy to see how these images were produced. A nearly horizontal stratum of dense air, whose surfaces were slightly inclined to one another, with a rarer medium above and below, might form such a multiple image, by successive reflections and partial refractions at the lower surface, the sun-beam which furnished the direct or principal image to any observer, A, furnishing the second, third, &c., images to observers behind him, so to speak, and sun-beams behind the former, successively furnishing A with the images forming the upper part of the pillar.

I understand that German physicists give this phenomenon the name of Sonnensäule—sun-pillar—and that they have published some speculations as to its origin. I hope some of your readers will kindly contribute information on this subject.

"Felix qui potuit rerum cognoscere causas."

Omagh, Co. Tyrone R. V. D.

P.S.—Since writing above I have learned that the "sun-pillar" was visible over a district of the north-east of Ireland, extending from Portrush in the north to Armagh in the south, and from Bangor (Belfast Lough) on the east to Omagh on the west. I have also heard from two intelligent correspondents that it was visible at sunset, when it attained an altitude of 30°; and from two others that it presented to them the appearance of being crossed by bands, alternately of a brighter and darker shade.

Freezing Phenomenon

I HAVE waited to see whether anyone else would notice a letter that appeared in NATURE, vol. xiv. p. 191, from Mr. Power, under the above heading. Failing such notice, may I point out that the phenomenon to which he refers has already been described. Plumes produced by the crystallisation of water form the frontispiece to Dr. Tyndall's Lectures on Light (Longmans, 1873), and a description of them is given in p. 257 of that volume.

Mr. Power suggests that the brittleness of iron in cold weather may perhaps arise from somewhat similar molecular groupings occurring within the metal whilst it contracts in cooling.

One must, however, recollect that water *expands* when cooled from 39° Fahr. down to the freezing-point. To this the action of cold upon iron affords no parallel, for cold renders the metal more dense. Cold brings the atoms into closer connection; hence cold will (presumably) tend to augment the strength of their mutual attraction. H. M. ADAIR

July 18

Habits of Parasitic Crab

SOME days since I obtained in the trawl a large specimen of the common Ascidian (*A. Virginea*) and kept it alive for about a week. It contained a specimen of the small Parasitic Crab (*Pinnotheres pisum*) about the size of a threepenny piece. The crab came out every night to feed about the floor of the tank, and found lodging during the day, as I afterwards proved by dissection, in the branchial cavity of the Ascidian. The crab is commonly found in the mussel, but I was not aware before that it ever wandered abroad, or sought food except within its tenement. W. S. G.

Kenmare

THE ROWTON SIDERITE

"AN addition of exceptional interest has recently been made to the collection of meteorites in the British Museum, by the presentation, on the part of the Duke of Cleveland, of a siderite (iron meteorite) which fell on his Grace's property at Rowton, near Wellington, in Shropshire, about seven miles north of the Wrekin, on the 20th of April last. At about twenty minutes to 4 o'clock on the day mentioned, a strange rumbling noise was heard in the atmosphere, followed almost instantaneously by a startling explosion resembling a discharge of heavy artillery. There was neither lightning nor thunder, but rain was falling heavily, the sky being obscured with dark clouds for some time both before and after the incident narrated. About an hour after the explosion, Mr. George Brooks, stepson of Mr. Bayley, had occasion to go to a turf field in his occupation adjoining the Wellington and Market Drayton Railway, about a mile north of the Wrekin, when his attention was attracted to a hole cut in the ground. Probing the opening with a stick, Mr. Brooks discovered a lump of metal of irregular shape which proved to be a meteorite weighing 7¾ lbs. It had penetrated to a depth of eighteen inches, passing through four inches of soil and fourteen inches of solid clay down to the gravel—conclusive evidence of the force of its impact with the earth. The hole (which has been protected for further investigation) is nearly perpendicular, and the stone appears to have fallen in a south-easterly direction. Some men were at work at the time within a short distance, and they, together with many other people in the neighbourhood, heard the noise of the explosion."

The above account is taken from the *Wolverhampton Chronicle*, and a further notice is given in the *Birmingham Daily Post* of a meeting of the Natural History Society of Birmingham, at which meeting Mr. Brooks, accompanied by Mr. Gibbons, of Wolverhampton, and Mr. Wills, exhibited the meteorite. Mr. Wills described the circumstances attending the fall, stating that the "sound was heard as of something falling during a heavy shower of rain accompanied by a hissing and then a rumbling noise;" he further stated, "that when Mr. Brooks found the mass it was quite warm." Mr. Wills described it as "being black on the surface, and apparently covered with a scale of metallic oxides; but at the point where it impinged on the earth the oxides had been removed, and the metallic character of the mass had been revealed."

To these interesting and accurate observations, made by the gentlemen of the locality, I have the pleasure of adding that I believe it was very much owing to a resolution passed by this valuable local society, at the suggestion of the gentlemen whose names have been mentioned, to which must be added that of the well-known petrologist, Mr. Allport, of the Rev. H. W. Crosskey, and Mr. Woodward, that Mr. Ashdown, the agent of the Duke of Cleveland, took action in the matter, and obtained his Grace's assent to the meteorite being presented to the trustees of the British Museum.

On its arrival in this department it was with no small pleasure that I found the description of Mr. Wills was in all points accurate. It is, indeed, an iron meteorite, and the special interest of this statement lies in the fact that though our great collection of 311 distinct meteorites at the museum contains 104 indubitable iron meteorites, the falls of only seven of the latter were witnessed.

The collection contains eight stony meteorites that have fallen in the British Islands; but the Rowton meteorite is only the second iron meteorite known as having been found in Great Britain.

It is thus not without a keen curiosity that one inspects a freshly fallen fragment of iron just arrived from space in our own country. One hastens to ask of it what impression the action of the atmosphere has made upon its surface during its brief transit, since most of our iron meteorites have undergone long weathering in the earth. Mr. Wills, however, has given that answer. The meteorite was covered with a very thin pellicle of the jet-black magnetic oxide of iron, and only where this had been rubbed off by abrasion with the soil is the bright metallic surface of the nickeliferous iron revealed. The little meteorite has all the usual appearance of being a fragment. Irregular and somewhat angular in form, with its edges rounded, no doubt, by the fusion and removal of no inconsiderable part of its material in its encounter with the atmosphere, it presents but very slight traces of the finger-and-thumb marks which so characteristically pit the surfaces of most stone and of some iron meteorites. Furthermore, there are fissures which penetrate deeply into the iron mass and bear testimony which there can be no gainsaying to the action of disruptive forces of tremendous strength during the hot encounter of the original mass with the atmosphere, and of which one explosion, and the rumbling echoes, possibly, of others, recorded by the witnesses bear evidence. The form of one of these fissures throws instructive light on the cause of the pitted surface of meteorites. The depth to which the little mass penetrated a stubborn soil is proof of how much momentum still remained to it, partly due, no doubt, to the approximately vertical direction in which it penetrated the atmosphere, and in some degree, too, to the higher density of an iron mass as compared with one of stone, the stony meteorites rarely penetrating to so considerable a depth. This depth of penetration and the direction of the little mass in space near north to south offer close resemblance between this iron and the iron meteorite of Nedagolla, in India.

There are indications on the metallic surface of the composite crystalline structure revealed by etching iron meteorites with acids, and known as the Widmannstattean figures, the results of the separate crystallisation of different alloys, often demarked in some of their surfaces by plates of metallic phosphides.

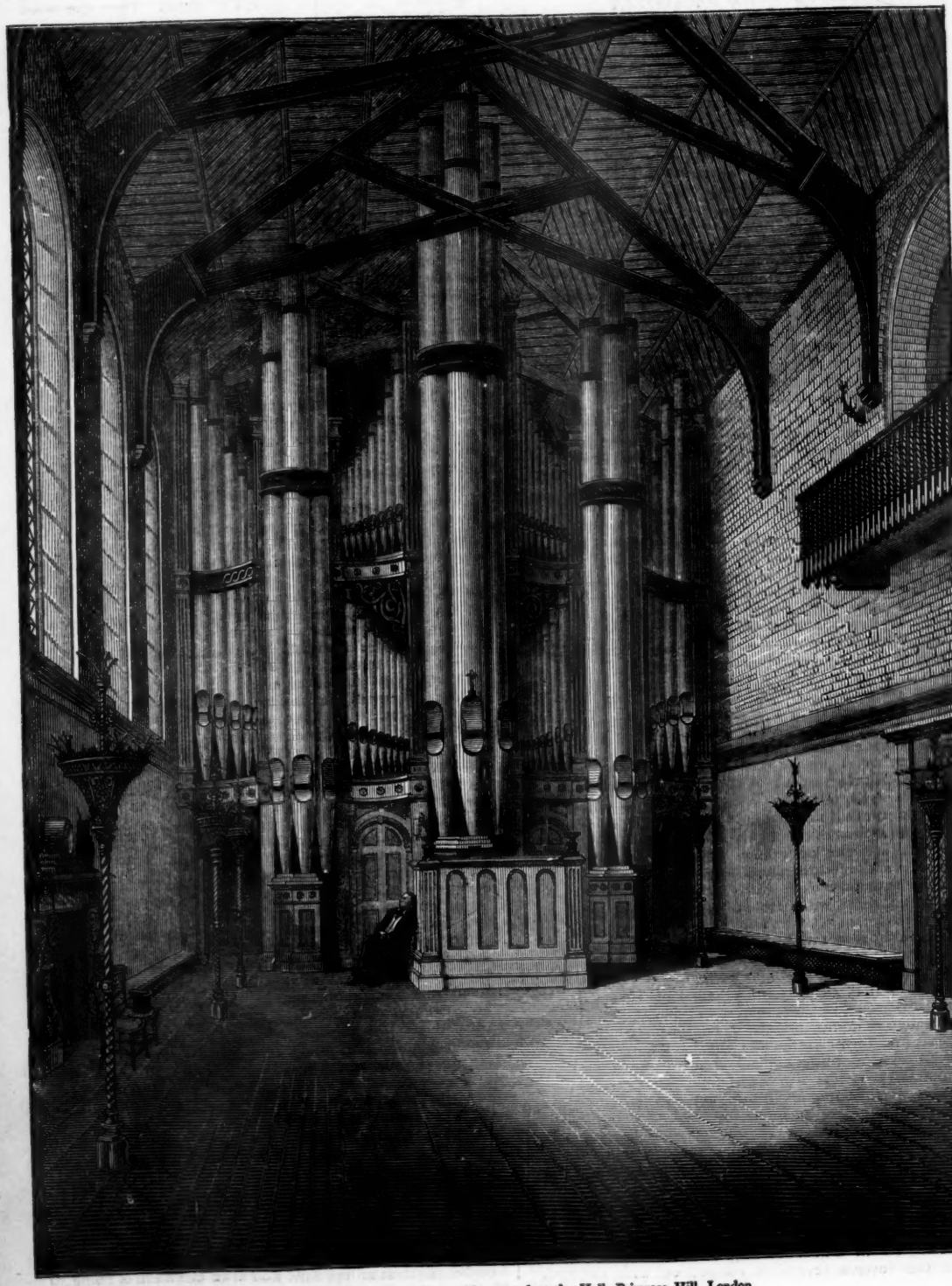
The development of this structure and the consequent determination of the particular type of iron meteorite to which the Rowton siderite belongs, as also the analysis of the iron itself, can only be carried out after a small portion of the meteorite shall have been carefully cut off by the aid of a lapidary's wheel, a process requiring in this particular case some careful precautions to prevent rust being hereafter formed and to reduce the loss of material to a minimum.

N. S. MASKELYNE

A MODERN ORGAN

IT has been hitherto chiefly on the Continent of Europe that connoisseurs in the majestic tones of the king of instruments have had to seek for a grand organ. Though London, the mistress of the world for wealth and magnitude, has churches and chapels innumerable, and organs by hundreds, scarcely one is of sufficient importance or merit to attract the attention of a stranger. Church organs are, as a rule, small, and built without individuality or character of tone, and generally so placed in the building as to effectually mar in acoustical effect any special merit they might otherwise possess. Of the two or three instruments that have any pretensions to magnitude to which the public has access—at the Albert Hall and the Alexandra and Crystal Palaces, no very lasting impression remains upon the audience beyond that of noise and a distressingly harsh volume of sound, utterly devoid of musical depth and grandeur of tone, and quite different from the pleasing reminiscences that dwell upon the memory from hearing some of their more musical Continental rivals at Haarlem, Freiburg, or Lucerne. To successfully construct a large organ is a work of exceeding difficulty, for not only does size greatly complicate the mechanical action, but the proper distribution and apportionment of the wind to each stop, and the harmonious blending of the whole together in the full organ, demands great knowledge and skill upon the part of the builder. It is for these reasons that very few large organs rise beyond mediocrity, or are noted for the beauty of their tone or the perfection of their mechanism. The great advance in the general taste for organ music within the last few years has necessitated an improvement in the mechanical construction of the organ, so as to enable the performer rapidly to command the entire resources of the instrument at will, and give him absolute control over the various sound-combinations and tone-colouring of the different stops, according as they are brought on or off by means of the appliances placed at his disposal.

We give a brief description of the very remarkable organ recently erected at Primrose Hill Road, Regent's Park, remarkable alike for its size, being larger than the great Haarlem organ, its beauty, richness, and grandeur of tone, and the completeness of its mechanism. At present this superb instrument is almost entirely unknown to the musical section of the public. The annexed illustration shows that this organ is one of the first magnitude. It possesses what is known as a 32-feet metal speaking front, with a corresponding weight of tone throughout the pedal organ, and several organs which together constitute the instrument, and give it its place in the scale of magnitude as compared with the more celebrated of the continental instruments. The instrument in question has several novelties not to be found in other organs. It possesses seven distinct organs: pedal, great, choir, swell, solo, echo, and carillon organs, each extending the full compass of 5 octaves (61 notes) with the exception of pedal organ, 30 notes. These various organs are under the control of the performer by means of four manual key-boards, which together comprise sixty-seven speaking-registers, and these are combined together with various acoustical effects by means of thirty-one mechanical movements, making a grand total of ninety-eight sound-controlling registers, worked by hand and foot. The entire mechanical action necessary to control these registers and accessory movements is carried out by a novel application of atmospheric vacuum pressure. Two distinct systems of main air trunks extend throughout the interior of the organ in connection with the wind arrangements situated in the basement of the building. One of these systems of trunks is for the purpose of conveying the wind at different pressures to the sound boards of the various organs in connection with the musical speech of the several groups of pipes. Thus the wind supplied to the solo organ, swell reeds, and large pedal reeds, is the heaviest pressure employed in the instrument for producing the musical intonation of the pipes, namely, 6 inches. The wind pressure to the sound-boards of the great organ and swell flue work is 4 inches, that of the choir organ 2 inches, and the pressure of wind is again reduced in connection with the sound-boards of the echo organ to half an inch, the lightest wind upon which any organ has ever yet been attempted to be voiced. This question of wind pressure as affecting the voicing and musical intonation of the pipes of an organ is one of great importance, and upon the skilful adjustment to the size, diameter, and materials of which the pipes are constructed, depends the sweetness and quality of the musical tones produced. In the organ under notice the very light pressure of wind adopted affords an example for careful study and examination First, for the mellow sweetness and beauty of tone produced; secondly, for the promptness of speech obtained, as rapid as the articulation of a pianoforte string; and thirdly, for the immense volume of sound and power that can be produced from these light pressures, the combined effect of the full organ rivalling almost the artillery of heaven as thunder crash after crash bursts upon the ear. Much of the harsh unmusical tone of modern organs arises from this desire to obtain power at the expense of music by the employment of an over-pressure of wind. That age is not requisite to mellow an organ is demonstrated by listening to the diapasons and foundation stops of the Primrose Hill organ, which have all that ripe and fascinating sweetness of tone characteristic of Silbermann's finest instruments. These light pressures of wind constitute a remarkable feature in the construction of so large an organ. The second series of air trunks which permeate the interior of the instrument are in connection with two large vacuum exhaust bellows which, being continually actuated by the steam-engine used for blowing, maintain a constant vacuum pressure throughout the entire system of trunks, so that at any part of the organ an available mechanical power (that of the pressure of the atmosphere 15 lbs. to the square inch of surface) is at hand to be employed for the multitude of purposes required in a large instrument. To be obliged to have recourse to the old system of wooden rods, trackers, levers, and squares in endless complications, would have so weighted and impeded the action of the organ as greatly to destroy its musical capabilities. In most of the large organs constructed both at home and abroad, many parts of the mechanism are far from being so perfect as to leave no room for anything further to be desired, and the executant upon the instrument rarely is able to portray as rapidly his musical creations mechanically at his finger-ends as those creations in tone-colour flash through his mind. By the introduction of atmospheric vacuum pressure as the "motor" power, there is no complication of mechanical parts; an almost endless system of tubes being carried from the key-board registers to the sound-board sliders of the several organs. These tubes are in connection with powerful exhaust bellows and vacuum power-bellows attached to the sliders, so that any required stop is brought on or off instantaneously, however distant from the key-board. These tubes may be bent and twisted round corners in any direction, and the parts of the organ most difficult of access easily reached. No mechanical force is therefore necessary to be exerted at the keyboards, the mere touch of a key, register, pedal, or finger-button, at once brings its special tube and exhaust arrangement into operation. The wonderful completeness of this system of vacuum-tube action is beautifully illustrated by means of the echo organ—a complete instrument of 16 feet tone, situated some 100 feet from the key-boards of the great organ—and supported on corbels against an opposite wall at an elevation of some 30



View of "The Great Organ" recently erected at the Hall, Primrose Hill, London.

feet from the floor. The action of this organ is electrical, that is, there is no mechanical communication between the performer at the key-board 100 feet distant and the organ pallets which admit the wind to the pipes, save a small rope of 61 insulated copper wires—one wire for each note of the five octaves. The various stops of this distant organ are likewise controlled without mechanism—a series of vacuum tubes alone extending from the registers at the great organ to the sliders of the echo organ—which are thus brought on or off at the will of the performer by a silent action—at once accurate and instantaneous in its manipulation. The effect of this echo organ, is that of a large organ heard at a great distance. Without the aid of the electric action, and vacuum pressure, such an organ could not have been designed. Mechanical action would never have successfully developed such effects at such an extended distance.

The same vacuum system is also applied to the various pneumatic lever arrangements interposed between the keys at the consol and the wind-valves at the sound-boards to relieve the performer from any undue mechanical pressure that might detract from the promptness of repetition and delicacy of touch of the key action, the keyboards being thus rendered as light as that of a grand pianoforte. Such results cannot be obtained so efficiently by the employment of compressed air for a pneumatic power action; compressed air will always prove to be more or less sluggish, a "creeping on" and "creeping off" movement being the result, besides a limit to the aggregate of the instantaneous power that is at command.

The pneumatic drawstop action of the St. George's Hall organ, Liverpool, is a fair illustration of the defects of the compressed air system. In the Primrose Hill organ upwards of forty registers can be simultaneously drawn on or shut off as easily and with the same precision as though only a single stop were drawn. The consol or keyboards of this organ, as will be seen by the engraving, are reversed, that is, the performer faces the audience, the organ being behind, and the echo organ opposite him. The lowest keyboard manual is the "great organ;" the next, or second from the bottom, the "choir organ;" the third in the series the "swell organ;" and the fourth, or upper row of keys, the "solo organ." By a simple mechanical arrangement this fourth keyboard is also used for the electric "echo organ," and also for the carillon, or "bell" organ, otherwise it would have been necessary to have introduced a fifth set of keys, an arrangement at all times objectionable from the increased complications imposed upon the performer. The touch of the carillon organ on the fourth row of keys is expressive like that of the pianoforte key, and gradations of tone and distance are therefore capable of being expressed upon the bells.

In this organ the French ventil system of shutting off or bringing on the wind to a complete family or group of stops by the depression of a pedal has not been adopted, such a system being found inadequate to effect rapidly the almost endless combinations that such a large instrument has at command, the pneumatic combination foot pedals and finger buttons at the keyboards being introduced as a more convenient form of manipulating the registers.

The wind supply of this gigantic organ is furnished from four large reservoirs in the basement, which again supply seventeen reservoirs in connection with the various sound-boards of the organ; the vertical feeders for producing the wind to these reservoirs, as well as for creating the vacuum pressure, are set in motion by an eleven horse-power steam-engine. The wind supply is so ample, that with the power of the full organ it is impossible to exhaust or create unsteadiness in the wind; few organs are properly constructed in this important respect. An ingenious automatic lever engine for regulating the motion and the supply of wind from the vertical feeders into the reservoirs according to the demand of the organ, is placed between the steam-engine and the wind reservoirs, so that the regulation of the wind supply is independent of the speed of the engine, which remains constant. This instrument, which occupied three years in its construction, and was opened in January, 1876, has been erected under the personal supervision of Mr. W. T. Best, of Liverpool, by the eminent organ builders Messrs. Bryceson Brothers, and Morten, of London, for Mr. Nath. J. Holmes, and is erected in the large music-room at the Hall, Primrose Hill Road, built expressly to receive it. The instrument, which stands 50 feet high, 30 feet broad, and 30 feet deep, suffered severe injury from the effects of concussion, in common with the building in which it is erected, at the time of the disastrous explosion of gunpowder on the Regent's Park Canal, near Primrose Hill.

PALÆONTOLOGY AND THE DOCTRINE OF DESCENT

"THE great biological question of the day is the problem of evolution; but geologists, as Kant says, are the archæologists of nature, and the sole direct and irrefragable evidence of the method whereby living things have become what they are is to be sought among fossil remains." Such were the words spoken by Prof. Huxley on a recent occasion, when receiving from the hands of the president of the Geological Society the Wollaston medal; and the assembled geologists, calling to mind his masterly review of the whole question in his address to them in 1870, rejoiced to hear their former president expressing the hope that much of his future labour would be concentrated on this all-important palæontological problem.

The discoveries of such abundant mammalian remains in the Tertiary deposits of the Western territories of America have added much valuable material to that already obtained from the Paris basin, the Sivalik Hills, Pikermi, and many other districts; and we may look forward with confidence to the labours of vertebrate palæontologists for bringing to light many interesting relations between the members of the existing fauna and their ancestral representatives in the later geological periods.

In the meanwhile it may not be uninteresting to point out that among the invertebrata similar evidences of the transitions between life-forms which at first sight appear to constitute perfectly distinct groups, are constantly being detected by palæontologists. No opportunity for doing this more effectively could possibly be desired than that which is afforded by the publication of a most suggestive and valuable monograph by the distinguished palæontologist of Vienna, Dr. Neumayr, in conjunction with M. Paul of the Austrian Geological Survey, a work which has just apppeared in the seventh volume of the *Abhandlungen der k. k. geologischen Reichsanstalt*. The title of this memoir is "Die Congerien- und Paludinen-schichten Slavoniens und deren Faunen; ein Beitrag zur Descendenz-Theorie;" and its authors have earned the thanks alike of geologists and biologists, for the important evidence on the great question of evolution which has been the fruit of their patient researches.

The geological formation which has afforded the evidence in question is the grand series of lacustrine beds forming the highest portion of the magnificently developed Tertiaries of Eastern Europe, and which constitute the approximate equivalent, in all probability, of our Pliocene; and it is a district on the southern limits of the Austrian Empire, the border-land of that area to which the attention of all Europe has been so painfully drawn for many months past, that has furnished the valuable sections of this formation and the abundant fossil remains, the

discussion of which is the object of the memoir we are noticing. On the northern bank of the Save there rises from the "diluvium" of the vast Hungarian plains an "island" composed of various crystalline, Triassic, and Tertiary rocks, and on the southern side of this tract of older deposits and upheaved along its flanks, between the towns of Alt Gradiska and Turkish Brod, stretches a vast mass of strata, constituting probably the most magnificent representative of the latest stage of the Tertiary period which geologists have as yet had the good fortune to discover.

The strata in question consist of sands and clays, with numerous beds of lignite, and it is to the value of the latter as fuel that we are indebted for those excavations which have afforded such excellent opportunities for studying the successive series of faunas of the formation. The whole of the beds appear to be of lacustrine origin, and have been accumulated, doubtless through the long-continued subsidence of the area, to the enormous thickness of about 2,000 feet; the lower division of the strata known as the "Congerien-Schichten," appears to have been formed under brackish-water conditions, but their upper and by far their thickest portion was certainly accumulated in fresh water. This upper fresh-water series, the "Paludinen-Schichten," is divided by our authors into three principal groups, comprising eight zones, each of which exhibits a well-marked and characteristic fauna.

The group of shells which affords the most interesting evidence of the origin of new forms through descent with modification is that of the genus *Vivipara* or *Paludina*, which occurs in prodigious abundance throughout the whole series of fresh water strata. We shall not, of course, attempt in this place to enter into any details concerning the forty distinct *forms* of this genus (Dr. Neumayr very properly hesitates to call them all *species*) which are named and described in this monograph, and between which, as the authors show, so many connecting links, clearly illustrating the mode of derivation of the newer from the older types, have been detected. On the minds of those who carefully examine the admirably engraved figures given in the plates accompanying this valuable memoir, or still better the very large series of specimens from among which the subjects of these figures are selected, and which are now in the museum of the Reichsanstalt of Vienna, but little doubt will, we suspect, remain that the authors have fully made out their case, and have demonstrated that, beyond all controversy, the species with highly complicated ornamentation were variously derived by descent—the lines of which are in most cases perfectly clear and obvious—from the simple and unornamented *Vivipara achatinoides* of the Congerien-Schichten. It is interesting to notice that a large portion of these unquestionably derived forms depart so widely from the type of the genus *Vivipara* that they have been separated on so high an authority as that of Sandberger, as a new genus, under the name of *Tulotoma*. And hence we are led to the conclusion that a vast number of forms, certainly exhibiting specific distinctions, and, according to some naturalists, differences even entitled to be regarded of generic value, have all a common ancestry.

The vast Tertiary lake-basins of Eastern Europe, in which similar conditions were maintained during such an enormous period, and in which such an unbroken sequence of deposits was accumulated, offer, of course, a particularly favourable opportunity for investigating the relations existing between successive life forms. The disturbing elements, arising from rapid variations in physical conditions attended with the circumstance of the immigration of forms from other areas, and the consequent retreat of the older fauna, the evidence of which is so constantly detected in the case of geological formations of marine origin, are here to a very great extent eliminated; and hence we are able to trace with marvellous precision the exact pedigree of an immense number of diverse forms.

We may, however, be permitted to add that much of the failure in recognising the undoubted ancestral relationships which exist between many marine invertebrate fossil forms, appears to arise either from prejudice on the part of the observers, or from that unfortunate divorce between the work of the physical geologist and the palæontologist, which, in this country at least, tends to confine the former entirely to the field, and the latter as absolutely to the museum. In no way can the admirable results which may be expected to ensue from the combined study of the physical and palæontological characteristics of a formation be better exemplified than by an appeal to the publications of the Geological Reichsanstalt of Vienna. In the same volume of the *Abhandlungen*, which contains the valuable memoir to which we have alluded in the former part of this article, is published a second instalment of Dr. E. Mojsisovics' splendid monograph, "Die Mollusken-Faunen der Zlambach und Hallstätter-Schichten," in which the wonderfully-varied molluscan forms of the Alpine Trias are so admirably described, their derivation traced, and their relations to the Palæozoic and Mesozoic types clearly indicated. While the study of such exceptionally well-preserved faunas as those we have alluded to cannot but impress us with that incompleteness which is undoubtedly the usual characteristic of "the geological record," it nevertheless leads us to entertain the hope, and even to express the certainty, that in the hands of the palæontologist lies the key to that mystery which at present envelopes the laws that have governed the appearance of the successive forms of life.

J. W. JUDD

PRIZES OFFERED BY THE DUTCH SOCIETY OF SCIENCES

THE following subjects for prizes have been proposed by the Dutch Society of Sciences, Haarlem.

1. To make a complete experimental study of the question whether a Daniell element can decompose water, and to submit to a critical examination the theories according to which it does or does not possess this power.

2. What are the meteorological and magnetic phenomena which there are sufficient reasons for believing to be connected with sun-spots?

3. It seems to result from certain experiments of M. Bunsen (*Ann. der Chem. und Pharm.* lxxxv. p. 137, *et. seq.*, 1863), that when mixtures of hydrogen and carbonic oxide are inflamed in a eudiometer with a quantity of oxygen insufficient for complete combustion, there always remains a part of the two combustible gases, and that the quantities of water and of carbonic dioxide which are formed have the relation to each other of simple multiples of their molecular weights. The same will hold good for the quantities of carbonic monoxide and carbonic dioxide which are generated by the combustion of cyanogen by means of a limited quantity of oxygen. The Society requires that these experiments be repeated on a more extended scale, with gaseous mixtures of very diverse composition, and by varying considerably the proportions of the constituents.

4. The researches of Mr. Lockyer concerning the difference of the spectral lines which calcium gives by means of electricity at different temperatures, have excited in a high degree the interest of the Society which requires that these important researches be extended to other elements.

5. Give a critical *résumé* of the observations and experiments concerning the existence of Bacteria in the contagious diseases of man, followed by original researches on the same question, studied in one or more of these diseases.

6. The society requires a simple instrument by which temperatures above 350° C. may be measured in degrees of the air-thermometer.

7. Make researches on the influence which the different colours of the spectrum exercise on the life of the lower animals.

OUR ASTRONOMICAL COLUMN

DE VICO'S COMET OF SHORT PERIOD.—According to the limits for the value of the mean diurnal motion of this comet when it was last observed, in 1844, assigned by Prof. Brünnow from his later researches, the results of which are published in the *Astronomical Notices* issued during his direction of the Observatory of Ann Arbor, Michigan, it would appear that in the absence of any great perturbation a perihelion passage may be expected to occur some time in the twelve months following the beginning of December next, and those who occupy themselves in searching for comets might advantageously institute during that interval a systematic examination of the parts of the sky in which the comet must be situate according to different suppositions as to the date of arrival at perihelion.

The comet of De Vico is most favourably placed for observation when the perihelion falls about Sept. 4, in which case it approaches the earth within 0·2 of our mean distance from the sun. It follows therefore that in 1844, when the comet was in perihelion about midnight on Sept. 2, the conditions were nearly at their best. The comet was detected at Rome on August 22, and was observed by O. Struve at Pulkowa, till Dec. 31. In a masterly discussion by Prof. Brünnow, entitled *Mémoire sur la Comète Elliptique de De Vico*, which gained the prize offered by the Royal Institute of the Netherlands, the elements for 1844 are determined by the most refined methods, and are accurately perturbed not only to the next return in 1850, when from the position of the comet in the heavens there appeared no possibility of its being observed, but to the second return in 1855, when the perihelion is fixed to August 6, ephemerides to facilitate its re-discovery being added to the memoir. From whatever cause, however, the comet was not found in 1855.

The mean motion finally adopted in Brünnow's memoir for the perihelion passage in 1844 corresponds to a revolution of 1996·3 days. In the subsequent calculations to which reference is made in the Ann Arbor *Notices*, he finds a value which diminishes the period of revolution to 1994·0 days, and, as regards the probable error of this determination of the amount of daily sidereal motion (649″·936), he shows that his work rather tends to exclude a greater one than 2″. Nevertheless he particularly insists that too much stress should not be placed on this indication, pointing out the possible influence of a small but variable error in the sun's places, which were taken from Carlini's Tables, and likewise the effect of variation in the form of the comet during the time it was under observation, upon the deduced positions. It does not appear upon what authority Brünnow assumes the reality of material changes in the aspect of the comet. The writer of these lines had the comet under frequent observations particularly after the middle of October, when, as it was receding from the earth, variation of figure by influencing the judgment as to the point to be observed would have had most effect, and well remembers that even to the last week in December, when it had become little more than a glimpse-object with 7 inches aperture, there was still an extremely minute nuclear point, which, with a larger instrument, would admit of very accurate bisection. The comparison with the Pulkowa observations (*Mémoire*, p. 29) affords no evidence of any effect of the kind suggested by Brünnow.

Now there is one point, hitherto it is believed unnoticed in the astronomical periodicals, which bears upon the non-recovery of the comet of late years. Brünnow drew attention to the close approximation of the orbit of De Vico's comet to the orbit of the planet Mars at two points falling near 42° and 287° of heliocentric longitude. If we adopt his later elements, we find that at the first point the distance between the two orbits was 0·0226, and at the latter point 0·0104, distances which, as Brünnow remarks, are "assez petites, pour produire des perturbations sensibles, quelque petite que soit d'ailleurs la masse de la planète perturbatrice;" and it is to be borne in mind that the above distances, small as they are, may have been diminished very sensibly by the effect of accumulated perturbation since 1855, beyond which we have no calculation of the effects of planetary attraction. If the mean diurnal motion in 1855 were as large as 652″·05, a value considerably within Brünnow's suggested limits, the comet might have come into extremely close proximity to Mars at the end of August, 1866, in about 42°·3 heliocentric longitude.

While, however, the above appears a certainly possible contingency, it is not, perhaps, necessary to suppose the existence of any unusual cause for the non-recovery of the comet. As occurs with most of these bodies, there are certain periods of the year at which observation would be impracticable; in the case of the comet of De Vico, this disadvantageous period would fall chiefly in the first four months of the year, the perihelion point then falling on the opposite side of the sun to the earth, and the inclination of orbit being very small. How far this may bear upon the question may be judged from the fact of there being no record of this comet having been observed between the year 1678, when Le Verrier identifies it with the comet discovered by Lahire at Paris, and the re-appearance in 1844; and it is worthy of remark that the perihelion passage in 1678 fell only one week earlier than the date which may be considered the most favourable.

A more particular examination of the comet's track in the heavens at different periods of the year is deferred for a future column.

MIRA CETI.—The minimum for 1876, calculated by Argelander's formula of sines from the epoch of Schönfeld's last catalogue, *i.e.*, by applying the same perturbations to minimum as to maximum, falls September 1·2, and may therefore be observed under favourable circumstances. There are comparatively few good determinations of the minima epochs, or of the magnitude of the star at these times, which will justify a hint that it should be watched on this occasion.

RESOURCES OF SERVIA AND BOSNIA

THE small extent of country upon which the eyes of Europe are now centred lies too far out of the beaten tracks of travellers for much to be generally known as to its capabilities or natural resources; nevertheless the country is described in the few existing works as being very fertile, and the soil might be made much more productive were it not for the idle and dirty habits of the people. In these days of "Special Correspondents," the breaking out of a war, even in the remotest parts of the world, is a signal for the dispatch of men of observation, whose duty it is to chronicle the movements of the opposing parties, and, in some cases—we wish it were more often so—to give us glimpses into the habits of the people and the natural features of the country. Thus, we may in the course of a few weeks learn from the public press more about these matters in connection with the small districts now at war with Turkey than we are able to gain from books. The mines of Servia and the forests of Bosnia are two of the principal sources of revenue to the countries. Both iron and copper can be obtained, not only in large quantities, but also of excellent quality. The best Bosnian iron resembles that of Sweden, and is largely used in the manufactories of Gratz, in Styria; quantities also pass into Dalmatia and Servia. These mines are mostly worked by English companies under concessions from the authorities. In the forests are several species of oak, including the evergreen, or Holm Oak (*Quercus Ilex*), the Turkey Oak (*Q. Cerris*), *Q. Ægilops*, *Q. infectoria*, and others. The

first two are of little or no use economically, except perhaps, for their woods, and these are not so highly valued as those of other species; the *Q. Ægilops*, however, which produces large acorns seated in very large cups, is valuable for the sake of these cups, which contain a large quantity of tannin, and are extensively used by tanners and dyers, being imported to a considerable extent from the Levant under the name of Valonia. *Q. infectoria* is also a valuable species, producing, most abundantly, the large shining brown galls known as Mecca galls, used for dyeing purposes, in the manufacture of ink, and in the preparation of tannic and gallic acids. The principal value of the oaks in Bosnia seems to be in their timber, the staple use of which is in the manufacture of staves for casks, immense quantities of which are exported. Amongst the pines occurring in the forests are *Pinus Laricio*, *P. maritima*, *P. halepensis*, and others, as well as the Scots Fir, *P. sylvestris*. Besides these are other forest trees of more or less value, so that if the forests were properly worked, they would not fail to prove of great value. At present, however, the right of cutting timber is held chiefly by foreign speculators, and has proved a source of wealth to many Austrians and Frenchmen who have embarked in it.

One of the most valuable products, both of Bosnia and Servia, as at present developed, lies in their plum crops, many of the peasantry depending entirely on these fruits as the means of subsistence through a great part of the year. The plums, after being gathered, are mostly dried in the form of prunes, the secret or art of drying being known only to themselves. The Bosnian plums are considered of a better quality than those either from Servia, Croatia, or Austria. A quantity of spirit is likewise prepared from these fruits. Amongst other vegetable products of the country may be included tobacco, potatoes, flax, hemp, walnuts; and amongst cereals, wheat, maize, barley, oats, rye, millet, &c. Wheat and maize are the principal food plants consumed in the country, some of the other products being exported in comparatively large quantities.

A notice of the resources of Servia, however brief, could not be closed without a reference to the remarkable traffic in pigs, the value of which amounts to nearly one-half of that of the entire exports of the country. In one year 472,700 of these animals were exported from Servia, the bulk of which are fattened at Steinbruch, near Pesth, in Hungary, where more than 500,000 pigs from various parts are fattened yearly. Their value is not on account of their flesh as an article of food, but exclusively for melting down for their fat.

From these notes it will be seen that in Servia and Bosnia are numerous undeveloped natural resources, and, under a different system than that which now prevails, both forests and mines might be made much more productive. J. R. J.

NOTES

THE French Association for the Advancement of Science will meet this year at Clermont-Ferrand. This meeting will possess unusual interest, as the Puy-de-Dôme Observatory will be opened for inspection for the first time to visitors. That establishment is now in operation, and the results of observations taken are regularly registered in the *Bulletin de l'Observatoire*. A large subvention has been voted by the Municipal Council of Clermont and by the Puy-de-Dôme department, a local Committee has been appointed for the reception of visitors, and the arrangement of excursions to the surrounding mountains, Mont Dore, and others. The session will be presided over by M. Dumas.

THE Council of the Yorkshire College of Science have added another subject to those taught at the College, by providing for a chair of Civil and Mechanical Engineering. They have elected as Professor, Mr. George Frederick Armstrong, M.A., F.G.S., Asso. Inst. C.E., who has for the past five years occupied the chair of Civil Engineering and Applied Mechanics in the McGill University, Montreal.

THE French Minister of Public Instruction, *L'Explorateur* informs us, is occupied with the organisation of scientific missions having for their object the study of certain determinate points in philology, geography, history, and commerce, both in France and the rest of Europe, as well as in Africa and America. The number of these missions will be thirty-two; twenty-eight are already completely organised. Nine missions will be occupied with natural history; one of these will investigate specially the fauna and flora of Switzerland; four will undertake researches connected with medicine and hygiene, four others dealing with languages; twelve will be occupied with the history and special investigations relative to peoples which have disappeared, or nearly so, as well as to their remaining monuments. Finally, three missions will undertake astronomical and meteorological investigations.

THE following are the numbers of visitors to the Loan Collection of Scientific Apparatus during the week ending July 22:—Monday, 2,275; Tuesday, 2,466; Wednesday, 486; Thursday, 393; Friday, 441; Saturday, 2,770; total, 8,831. During the present week 12 demonstrations were given on Monday, 12 on Tuesday, 5 on Wednesday; 7 are to be given to-day, 5 to-morrow; and 4 on Saturday, including the daily lectures to science teachers.

M. SCHÜTZENBERGER has been appointed to succeed the late M. Balard in the Chair of Chemistry in the Collége de France.

AN International Congress of Geography will be held at Brussels on Sept. 11. All the governments have been invited by the King of the Belgians to send delegates. The object of this Congress is the organisation of an international scientific expedition to Central Africa.

THE "Report of the Radcliffe Observer" for the year ending June 30 last, shows that the work of the Observatory has been carried on with efficiency. In all departments much good work has been done, and it is satisfactory to notice that the "Third Radcliffe Catalogue" has been commenced at last. Mr. Main's observations confirm those of other observers with regard to the recent remarkable absence of spots from the sun.

A LETTER in the current number of the *Planters' Gazette* draws attention to the continued importation and sale of filth, under the name of tea, which trade is carried on under the eyes, so to speak, of the Government officials themselves. The writers say:—"We have recently seen samples of mouldy refuse and dust which is now being retailed at the east-end at the rate of 2 oz. for 1*d.*, or equal to 8*d.* per pound, duty paid. We submitted the samples to an official occupying a responsible position in the city, but were informed that the Government could not interfere, as the rubbish had passed the Custom House. Three or four hundred packages of 'Maloo mixture' have been delivered from one of the up-town warehouses during the fortnight for shipment, we understand, to Rotterdam."

IN connection with the recent *Thunderer* disaster, we would draw attention to a lecture given to the Engineering Class in the University of Glasgow by Prof. James Thomson, "On the Principles of estimating Safety and Danger in Structures in respect to their Sufficiency in Strength." It is published by Maclehose of Glasgow.

A FRENCH barrister who died recently left by his will two large houses to the city of Paris, for the purpose of establishing a new municipal college. The houses have been sold for the sum

of 1,600,000 francs, and the municipal council is now busy carrying out the conditions of the will. It is said many improvements will be carried out in the new establishment.

A STATUE has been erected at Bayeux (Calvados) to M. de Caumont, who originated forty-two years ago the Congress of the French learned societies of the provinces. This year the meeting will take place at Autun (Haute-Marne) in the beginning of September.

LIEUT. CHRISTIE, R.E., writing to us from Madras with regard to the use of selenium in telegraphy, says that if we could do away with the man (or woman) signaller, and substitute a commutator actuated by a current of electricity generated by the action of light upon a piece of selenium, we should (supposing the sensitiveness of the selenium to be adequate) have a combination capable of enormously increased rapidity. The message to be transmitted would be first set up (by mechanical means) in the Morse character, in long and short *slits* in an opaque screen; and this perforated screen being passed rapidly between the selenium and a source of light, the currents of electricity would be generated which are required for actuating the commutator. The possibility of such a combination depends on the sensitiveness of selenium to the influence of light. Assuming the combination to be possible, the rapidity of signalling would seem to be limited only by either the mechanical conditions of the commutator (or relay), or the power of the printing instrument at the receiving station,

EVERYONE will be glad to hear of Mr. Stanley's safety, and of the success of the African Expedition, of which he is head. From the brief notice in yesterday's *Telegraph*, we learn that several despatches have been received from Mr. Stanley, the last dated April 24, 1876, from Ubagwe, in Unyamwezi, within fifteen days of Ujiji. Mr. Stanley further explored the Victoria Nyanza, and inflicted one of his regrettable "severe punishments" upon the people of Bambireh, for a former attack. The district between Victoria and Abert Lakes was explored, and a "strange tribe of pale-faced people" was met with in the "cold uplands" of a remarkable mountain, Gambaragara. He returned to Uganda, whence he set out to Ujiji, exploring the Kagera River, Speke's "Lake Windermere," and the hot springs of Karagwe. We regret to notice from a *Daily News* telegram that the Italian African Expedition has been badly treated by the "Emir of Zeila."

THE number of denizens of the Southport Aquarium has been lately increased by the birth of no less than 1,000 sea-horses in one of the tanks.

IN Prof. Loomis's "Contributions to Meteorology," fifth paper, just published in the *American Journal of Science and Arts*, an important point suggested is that when barometers are low and temperatures high in Iceland, barometers are high and temperatures low in Central Europe, and similarly that a like relation exists between the barometers and temperatures of the Aleutian Islands and those of the United States—the influence in both cases being most decided during the cold months of the year. The idea here thrown out is deserving of a thorough investigation by the facts of observation owing to its important bearings on weather-forecasting. It is shown in the same paper that, in the course of storms, the amount of rainfall is least when the pressure at the centre of the storm is increasing, or when the storm is diminishing in intensity; and the amount of rainfall is greatest when the pressure at the centre of the storm is decreasing, or when the storm is increasing in intensity, the effect being also most decided during the colder months of the year.

THE French Alpine Club will hold a General Congress at Annecy on August 13, 14, and 15. All the sections of the French Alpine Club will be present, and the English, Italian, and Swiss Alpine Clubs are expected to send a large number of representatives.

THE Vienna earthquake, to which we referred last week, occurred on July 17 at 1.22 P.M. The principal seat of the commotion was Scheibbs, a small country place forty miles west of Vienna; almost every house in Scheibbs has been damaged. The area of the commotion was very large, equal to about two-thirds of England. It reached Austria proper, Moravia, part of Bohemia, and Hungary. The last earthquake in Vienna was on January 3, 1873. Fifteen instances of earthquake have been recorded in Vienna from the [beginning of the thirteenth to the end of the eighteenth century. None of them produced any real damage, except those of September, 1590, and December 4, 1689.

THAT International Exhibitions have not quite failed to attract the attention of the world, is proved by the success which is attending the great undertaking at Philadelphia. A pamphlet of sixteen pages "The Forest Products of Michigan at the Centennial Exposition," by Prof. W. J. Beal, of the State Agricultural College, just received, is one of a shoal of similar essays which always emanate from these great shows, and which are often valuable contributions to the knowledge of the natural resources of the countries upon which they treat. Michigan, as is well known, is the head-quarters of the American timber trade; of this fact we are reminded that two-thirds of the best timber known in the New York, Philadelphia, and Boston markets is obtained from Michigan, besides which a good deal comes to Great Britain and Germany. Of North American building woods much in demand in the country may be mentioned pitch-pine, and the timbers of other species of the genus *Finus*, while among ornamental woods that of *Acer saccharinum*, the sugar or bird's-eye maple, as well as the black walnut, *Juglans nigra*, are extensively used. With the natural characteristic belief in his own country's greatness the author compares unfavourably not only the forests of Great Britain but also those of every other part of the globe, South America included.

MR. G. E. DOBSON, of the Royal Victoria Hospital, Netley, has just issued a very useful monograph of the Asiatic Chiroptera, founded upon a personal examination of almost all the materials available for the study of the Asiatic members of this group both in India and in Europe. To it is added a catalogue of the specimens of bats contained in the collection of the Indian Museum, Calcutta. The confusion hitherto existing in this difficult group of mammals is very great, and Mr. Dobson has done excellent service in putting them to rights. The catalogue is printed in London by order of the Trustees of the Indian Museum.

THE veteran naturalist, Dr. R. Schomburgk, sends us his Report on the Progress and Condition of the Botanic Garden and Government Plantations at Adelaide, South Australia, for the year 1875. The Garden seems to be in a most flourishing condition, the copious and wide-spread rains of the past year having had a most beneficial influence upon it, as upon the country generally. The Zoological branch of the establishment has received many accessions, and a long list is given of plants added during 1875, to those already in cultivation in the Botanic Garden.

THE American naturalists have lately devoted their attention to "Guadeloupe"—not the West Indian Island commonly known by a similar name, but a small island lying off the coast of Lower California, 220 miles south-west of San Diego. Eleven land birds were found by Dr. Palmer upon Guadeloupe Island, and specimens of them were transmitted to the National Museum at Washington. It is a most noteworthy fact that *every one* of these land birds is distinct from those found on the neighbouring

mainland, although each of them has a continental representative more or less nearly related. Variation in Guadeloupe seems to proceed at a rapid pace.

We have received the Ninth Annual Report of the Peabody Institute of Baltimore, from which we are glad to see that all departments of the Institute have been doing their work satisfactorily during the past year. We notice, from the librarian's report, that of the books taken out of the library a large proportion belonged to the various sciences.

Messrs. Stanley of New York and New Britain (U.S.), have devised a metre diagram, intended to supply a want long felt by all who undertake to study or teach the metric system. The diagram contains a full metre, with its various divisions and sub-divisions clearly indicated, and also an English yard with its sub-divisions, so that the two measures can be at once compared. To these are added explanations of the system, a variety of tables, equivalents, rules, &c., the whole forming an excellent apparatus for the effective teaching of this scientific method of measurement.

The series of the *Bulletins* of the United States National Museum, prepared at the request of the Smithsonian Institution, and published by the authority of the Secretary of the Interior, already embraces some very interesting and important memoirs relating to the collections in the National Gallery. The first of the series, by Prof. Cope, contains generalisations as to the geographical distribution of reptiles. The second *Bulletin*, prepared by Dr. J. H. Kidder, U.S.N., consists of a history of the birds collected by him during the transit of Venus expedition on Kerguelen Island. This, besides describing new species, gives a great deal of information as to the habits of the gulls, petrels, penguins, &c., of that little-known region. The third *Bulletin* completes the notices of the natural history of Kerguelen Island by an article describing the eggs of the birds, together with a list of the plants, rocks, mammals, fishes, molluscs, and other representatives of the peculiar animal life of the South Seas. In the pamphlet is also an enumeration of the specimens collected by Dr. Kershner, of the navy, in New Zealand. The pamphlet concludes with a critical investigation, by Dr. Kidder and Dr. Coues, of *Chionis minor*, the lesser sheath-bill.

The third edition of Prof. Snow's catalogue of the birds of Kansas has lately been published by the Kansas Academy of Science, and contains some important additions to the previous list. The present enumeration amounts to 294 species, making an addition of twenty-three species and one variety since the publication of the second edition in October, 1872. The number of species mentioned as breeding in the State is 136.

Prof. Marsh continues to find objects of interest in the immense collection of fossil vertebrates gathered by himself and his assistants in the West during the past ten years. We have already referred to his discovery of a new form of pterodactyl, characterised by the entire absence of teeth, and their probable replacement by a horny sheath like that of the bill of modern birds. He now announces two additional fossil birds possessing teeth implanted in sockets. One is a new species of the first division, *Hesperornis*, and the other forms the type of a new genus, *Lestornis* (*L. crassipes*), the remains of which indicated a large swimming bird, fully six feet in length from the bill to the end of the toes.

The Catholic Universities seem to have been a failure in France. According to an official account published by Government, about a hundred pupils have been registered in law. The number of medical students is limited to a few dozen in medicine, and there are only eight in science. However, the Catholics are collecting funds with unabated spirit, and 3,000,000 francs are said to be in hand for opening a Law Academy at Marseilles.

From the Report of the Auckland Institute (New Zealand) for 1875-76, we are glad to see that that society will soon have a new Museum building of its own. The Report contains a list of important papers which have been read at the Institute during the session. From New Zealand also comes the Report of the Auckland Acclimatisation Society, which, amid many discouragements, is doing good work by the introduction of salmon, trout, and various birds into the country.

The Report of the Rugby School Natural History Society is the largest yet issued, and contains several papers highly creditable to the young members, and showing that their writers are in a fair way of training themselves to be good observers. Among other papers worthy of mention, are the following :—"On the Symmetry of Flowers and Inflorescence," by V. H. Velej; "On Drops," "On Sound," and "On Impressions," by H. F. Newall; "On the Effects produced by Shadows under Water," by H. N. Hutchinson. Appended are various sectional reports and ten plates illustrating the papers, eight of which are drawn by members of the Society. Altogether the Society is to be congratulated on the Report.

A list of papers read before the Priestley Club, Leeds, during its first session, October to June, 1875-76, has been published. Thirty-six papers have been read, all of them on subjects of great scientific importance.

Mr. G. H. Kinahan has published in a separate form his paper on "The Lagoons on the South-east Coast of Ireland," read before the Institution of Civil Engineers.

The *Proceedings* of the Liverpool Naturalists' Field Club, for 1875-6, shows that that Society continues to do good and steady work. There is an interesting address by the President, the Rev. H. H. Higgins, on "The Names of Plants."

Part 4 of Vol. I. of the *Transactions* of the Watford Natural History Society contains a lecture, by Prof. Morris, on "The Physical Structure of the London Basin considered in its relation to the Geology of the neighbourhood of Watford;" a paper by Mr. R. A. Pryor on "The Supposed Chalybeate Spring at Watford, and on the Medicinal Waters in Herts," besides the rainfall in 1875, and miscellaneous notes and observations.

In reference to Mr. C. G. O'Brien's letter (vol. xiv. p. 123), on the beautiful spring-trap arrangement of the stamens of Kalimis, a correspondent writes that the point has already been noted by Dr. Robert Brown, in his "Manual of Botany," p. 440.

The following varieties have been added to the tanks of the Royal Westminster Aquarium during the past week :—Toper, or White Hound (*Galeus canis*), Sting Ray (*Trygon pastinaca*), Red Mullet (*Mullus surmuletus*), Boar-fish (*Capros aper*), Comber, or Smooth Serranus (*Serranus cabrilla*), Pope, or Ruff (*Acerina cernua*), Barbel (*Barbus fluviatilis*), English Carp (*Cyprinus carpio*), presented by Mr. W. R. Killick; Sea Cucumbers (*Holothuria niger*).

The additions to the Zoological Society's Gardens during the past week include eight Jameson's Gulls (*Larus jamesoni*) from Australia, presented by Mr. A. H. Jamrach; a King Vulture (*Gyparchus papa*) from Tropical America, two South American Little Bitterns (*Butorides cyanurus*) from South America, a Green-billed Toucan (*Kamphastos dicoloru*s), four Sayaca Tanagers (*Tanagra sayaca*), six Festive Tanagers (*Calliste festiva*), six All-green Tanagers (*Chlorophonia viridis*), two Violet Tanagers (*Euphonia violacea*) from Brazil, a Brown Howler (*Mycetes fuscus*) from Panama, a Madagascar Squirrel (*Sciurus madagascarensis*) from Madagascar, purchased; two Australian Bustards (*Eupodotis australis*) from Australia, deposited; an Eland (*Oreas canna*), nine Amherst's Pheasants (*Thaumalea amherstiæ*), thirteen Gold Pheasants (*Thaumalea picta*), bred in the Gardens.

SCIENTIFIC SERIALS

Mind, July.—This number has very little of interest for the general reader. Helmholtz, on the origin and meaning of geometrical axioms, maintains that geometrical axioms, in the form in which it may be maintained that they are not derived from experience, represent no relations of real things, that they have real import only when certain principles of mechanics are conjoined with them, and that then they are amenable to experience, and may be matters of inference.—Prof. Flint makes a clever fight for the non-derivative origin of moral ideas. He is very hard on the associationist philosophers. The laws of association, he says, will not explain how virtue, if at first loved merely as a means to happiness, comes subsequently to be loved for its own sake, apart from happiness. He denies that transformations of this kind are ever performed, and tries to show that in the case of avarice, the typical instance of the associationists, there is no such thing as the love of money for its own sake.—Mr. Pollock attempts to show, in reply to Mr. Sidgwick, that the doctrine of evolution is not quite without ethical value. He doubts whether the problem of the ultimate sanction of ethics in individual thought can strictly be deemed even rational. This is rather sad from our moral philosophers; with theology it has always been rational and simple enough.—Under the title, "The Original Intention of Collective and Abstract Terms," Max Müller endeavours to make out that Mill in his definitions of mind and of matter lost himself among words, and only jumped out of the frying-pan into the fire.—Mr. Shadworth H. Hodgson concludes his papers on philosophy and science. He opposes to pure ontological speculations the psychological impossibility of ever transcending the duality of subject and object. He retains for philosophy, however, a region avowedly beyond science, the same supra-sensible that Lewes rejects.—Mr. Lindsay gives an appreciative account of the Philosophy of Hermann Lotze, whom we are called on to admire as taking account of the spiritual no less than of the mechanical side of the universe. The history of philosophy at Dublin is written by Mr. Monck.—Among the Critical Notices is a reply by Prof. Bain to the arguments by which Mr. Alexander tries, in his "Moral Causation," to establish the doctrine of human freedom. Prof. Bain is exactly in his element, and the argument is exquisitely neat.—In each of the three numbers of *Mind* there have been notes on a question between Mr. Lewes and Prof. Bain, as to the warrant for our belief in the uniformity of nature, which show how difficult it is for philosophers to make themselves understood by one another.

Poggendorff's Annalen der Physik und Chemie, No 4, 1876.—In this number we find the second part of M. Winkelmann's memoir on heat conduction in gases; treating chiefly the subject of the relation of heat-conduction to temperature. The experiments were made with three apparatuses of different dimensions, consisting essentially of a spherical glass vessel with the bulb of a thermometer at the centre. The vessel could be filled with the gas to be examined; it was then placed in melting ice, boiling water, &c., and the time of cooling was observed. The theories of Clausius and Maxwell differ in the law they assign for variation of heat-conduction with the temperature. According to Clausius, the conduction increases proportionally to the square-root of the absolute temperature; according to Maxwell, proportionally to the temperature itself. The experiments of M. Winkelmann so far favour Maxwell's view of the law (though he does not regard them as confirming Maxwell's theory, in which the hypothesis of a repulsive force between the molecules acting proportionally to the fifth power of the distance, does not agree with experience, Thomson and Joule having shown that attractive, and not repulsive forces, act between the molecules). If the heat-conduction of air or hydrogen at 0° be made equal to 1, then at 100° it is equal to 1·364. The co-efficient for carbonic acid is considerably greater; the conduction at 100° (that at 0° being = 1) is 1·593; but it is less than the theoretical value (1·691), the variation of the specific heat of this gas with temperature being taken into account. M. Winkelmann further points out that the temperature co-efficient of friction of gases does not agree with that of the heat conduction.—In a contribution to the theory of the galvanometer, by M. Weber, will be found some useful directions in construction. Among other things he shows that galvanometers with "current-curve" of the form of two parallel lines connected by semicircles will, with only about a tenth expenditure of wire, show one-third greater sensibility than corresponding galvanometers with circular current curve.—M. Neesen offers an explanation of elastic reaction based on views furnished by the mechanical theory of heat as to the constitution of bodies.—M. Holtz describes a good apparatus for rendering visible the duration of the retarded discharge through rotation of the place of passage of the spark. It is only for sparks of long duration, and is meant in some sort as supplementary to the Wheatstone mirror arrangement as improved by Feddersen. The objections to which that apparatus is open, that it involves a weakening of the already weak light of the short discharges for which it is used, and that the extent of air to be broken through by the discharge is not invariable, here fall away.—In a new form of tuning-fork described by Dr. König the arms are penetrated by canals, which are connected below, and mercury is pressed up in them to any required height, from a neighbouring reservoir of the liquid; thus the tone is varied. The arms are excited by electrical means, as mere drawing of the bow would give sounds of too short duration.—Among other apparatus described are models of inclined planes, and an arrangement for illustrating the laws of parallelogram of forces.—M. Klein, from the Mineralogical Museum at Kiel, makes some contributions to a knowledge of gypsum.

Memoria della Società degli Spettroscopisti Italiani, January, 1876.—Statistics of solar eruptions in 1871, by Prof. Tacchini. It appears from these statistics that the number of eruptions on the western limb was double that on the eastern, the numbers being 66 and 31 respectively, observed on 122 days. The number on the southern hemisphere was one-third less than that on the northern, and the zone on which the most eruptions occurred is between 70° and 80° N.P.D., one only was seen north of 30° N.P.D.—Notes on spectroscopic observations in 1875, by Prof. Bredichin.—Researches on electro-static induction, by G. Pisati.—Researches on magnetism, by G. Pisati and S. Secchiloni.

February.—Daily notes of spots and faculæ near the limb of the sun, observed spectroscopically and directly, commencing February, 1874, by Prof. Tacchini. The reversal of the lines b_1, b_2, b_3, 1474, 4923, and 5017 appears frequent. The same observer gives the positions on the limb of the sun at which magnesium was seen from March to June, 1874.

March.—On the direction in space of the tail of Coggia's comet, by Prof. G. Lorenzoni. Tables accompany the paper, showing co-ordinates for the period from May 18 to July 14, 1874.—Prof. Schiaparelli gives a table of dates for 1876 and 1877, on which falling stars should be looked for. Table of solar spots observed in February and March last at Palermo. Statistics of solar eruptions observed in 1874. It appears that the number of eruptions on the western limb were three times that on the eastern, the number on the north being about one-fourth greater than those on the south.

April.—On the influence of eosin on the photographic action of the solar spectrum upon the bromide and bromo-iodide of silver, by Capt. Waterhouse. The watery solution of eosin gives by absorption two bands at about *E* and *F*, the alcoholic solution gives the bands rather nearer the red end of the spectrum. The action of this substance when added to the bromised collodion, or when a watery solution is poured over the sensitive plate, is to give greater sensibility to the plate for the green rays than to the blue, indigo, or violet, the maximum action being below *E*, extending to about half way to *D*. Ordinary wet collodion plates prepared with bromo-iodised collodion containing eosin prolongs the spectrum nearly to *D*.—Solar eruptions observed in 1872 by Tacchini, and spectroscopic observation on the sun in April, 1876.—The transparency of the air, by Prof. Ricco.

Zeitschrift der Oesterreichischen Gesellschaft für Meteorologie, April 1.—A paper lately appeared in this periodical, by Director Mohn, on the cause of the deeper barometrical depressions in winter than in summer, giving the author's reasons for having changed his opinion on the subject since the publication of his "Grundzügen der Meteorologie." In the present number we have a letter from Dr. Gustav Hellmann, upholding Herr Mohn's first explanation. Having shown how difference of barometric pressure depends upon difference of temperature and differences in the heights of the differing columns of air, and upon differences in humidity, and how these give rise to ascending currents, he states that the up-draught must be stronger in winter than in summer, because (1) the differences of temperature between two places are greater in winter than in summer, or the isotherms are nearer together; (2) decrease of temperature with height is half as great in winter as in summer; (3) the air is more saturated with moisture in winter. He lays stress upon

the fact that the barometer can only fall beyond the level due to the above-named differences when more air is carried away in the upper regions than comes in below. In this case the gradient is steeper at great altitudes than on the earth's surface, depending upon the strength of the up-draught, which is strongest in winter.—In the Kleinere Mittheilungen there is an article by Dr. Hann, on the cyclone of October 15, 1874, in Bengal, and one by Baron v. Friesenhof, on barometric maxima and minima in 1873 and 1874.

Nachrichten von der Königl. Gesellschaft der Wissenschaften, Göttingen, Nos. 22, 23, 24, 1875.—In these numbers will be found an account of some comparative experiments by M. Marmé, on the poisonous action of arsenious acid and of arsenic acid. Doses of the two acids containing equal amounts of arsenic (or with a little more in the arsenic acid dose), and diluted with water, were given to animals as similar as possible in age, weight, &c., being introduced directly into the circulation, or into the stomach, or the connective tissue. The symptoms are detailed. Without exception, the doses of arsenious acid proved more rapidly fatal than those of arsenic acid. The acid salts behaved similarly to the free acids. The fact is against Munck and Leyden's view, that arsenious acid in the blood is oxidised to arsenic acid, and that only as such it dissolves the blood-corpuscles, and causes fattening of various tissues and organs. The authors think it probable that when arsenic acid is introduced into the blood it is reduced to arsenious acid, and therefore its action appears more slowly. They further describe some experiments on the use of toxical substances to counteract arsenic acids.—M. Wöhler describes the properties of a fluorine mineral from Greenland, named "Pachnolith."—The remaining papers are mostly on chemical subjects, the principal one being by M. Hubner, on two nitro-salicylic acids and their employment in determining the nature of the hydrogen atoms in benzol.

SOCIETIES AND ACADEMIES

LONDON

Geological Society, June 21.—Prof. P. Martin Duncan, F.R.S., president, in the chair.—Mr. Hector Maclean and Mr. Samuel Trickett were elected Fellows, and Dr. L. Rütimeyer, of Basle, a Foreign Correspondent of the Society.—The following communications were read:—1. On the Ice-fjords of North Greenland and on the formation of fjords, lakes, and cirques in Norway and Greenland, by M. A. Helland. Communicated by Prof. A. C. Ramsay, F.R.S. The author described in great detail his observations on the glacial phenomena of Greenland, and applied their results to the consideration of the traces of glacial action exhibited in Norway. His view of the course of events in Norway is as follows:—Before the Glacial epoch thousands of streams commenced the work of erosion and produced valleys. During the Glacial epoch these valleys were enlarged and lake-basins were hollowed out. The descending glaciers ground out fjords to their full length when the Glacial epoch was at its highest, but as it declined the glaciers ground out the inner part to a still greater depth, producing the present characters of the marine fjords, and giving rise to lake-hollows in other places. That the glaciers once extended beyond the fjords is shown by moraine-matter being dredged up. Some of the sea-banks and islands off Christiania-fjord are old moraines; and if Norway should be raised 400 metres, these banks would show as moraines and plains before the lake-basins of the fjords. 2. On the drift of Brazil, by Mr. C. Lloyd Morgan. The author described the position and mode of occurrence of large boulders of gneiss and granite in the red drift of Brazil and on the slopes of hills even at considerable elevations, and stated that, like Prof. Agassiz, he could not see how these could have been transported to their present positions except by the agency of ice. He is inclined to believe that the drift, if of glacial origin, was not formed by glaciers taking their rise in any of the peaks indicated by him, but by an almost universal South-American ice-sheet.—3. Recent glacial and aqueous action in Canada and the drift-uplands of the Province of Ontario, by the Rev. Wm. Bleasdell. Communicated by the President. The author described the glacial action which takes place every winter in Canada, especially on the River St. Lawrence and its large lakes.—4. The glacial climate and the Polar ice-cap, by Joseph John Murphy. The author agrees with Mr. Croll in thinking that a Glacial epoch must be one of maximum eccentricity of the earth's orbit, and that the northern and southern hemispheres during such an epoch must be glaciated alternately; but he maintains in opposition to that writer that the glaciated hemisphere must have its *summer* in aphelion. He intends this paper to be a reply to Mr. Croll's objections to this theory as put forth in his work on "Climate and Time."—5. On the discovery of plants in the Lower Old Red Sandstone of the neighbourhood of Callander, by R. L. Jack and R. Etheridge, jun., of the Geological Survey of Scotland. The plant-remains are described as being of a very fragmentary nature. The authors discuss the relationships of these remains with other described Devonian forms, and regard them as most nearly allied to *Psilophyton princeps*, Dawson. They describe the plant with doubt as a species of *Psilophyton*.—6. On an adherent form of *Productus* and a small *Spiriferina* from the Lower Carboniferous Limestone Group of the East of Scotland, by R. Etheridge, jun., F.G.S., of the Geological Survey of Scotland. From the consideration of the characters presented by the more mature valves, the author stated that the nearest affinity of the species of *Productus* appears to be with *P. wrightii*, Dav., but that it shows peculiarities allying it to *P. longispinus*, Sow., *P. scabriculus*, Mart., and *P. undatus*, Defr. He was not prepared to describe it as a distinct species, but suggested for it the name of *Productus complectens*, in allusion to its embracing habit, in case of its proving to be distinct. The *Spiriferina* described by the author was compared by him with *S. cristata*, Schl., var. *octoplicata*, Sow., and with *S. insculpta*, Phill., from both of which it differs in certain characters; but as only one specimen has been met with, he refrained from founding a new species upon it. The specimen is from Fullarton Quarry, near Temple, Edinburghshire.—7. Notice of the occurrence of remains of a British fossil *Zeuglodon* (*Z. wanklyni*, Seeley) in the Barton Clay of the Hampshire coast, by Harry Govier Seeley, F.L.S. In this paper the author described the remains of a species of *Zeuglodon* obtained by the late Dr. A. Wanklyn from the Barton Cliff, consisting of a great part of the skull, about the same size as that of *Zeuglodon brachyspondylus*, Müller. The species, named *Z. wanklyni* in memory of its discoverer, differs from all known species of the genus in the shortness of the interspaces between the teeth.—8. On the remains of *Emys hordwellensis*, from the Lower Hordwell beds in the Hordwell Cliff, contained in the Woodwardian Museum of the University of Cambridge, by Harry Govier Seeley, F.L.S. The remains described by the author consist of some fragments constituting the greater part of the plastron and carapace of a species of *Emys*, for which he proposes for the species the name of *Emys hordwellensis*.—9. On an associated series of cervical and dorsal vertebræ of *Polyptychodon* from the Cambridge Upper Greensand in the Woodwardian Museum of the University of Cambridge, by Harry Govier Seeley, F.L.S. The author described in detail the structure of the atlas and axis and of the five succeeding (cervical) vertebræ; nine dorsal vertebræ were also described.—10. On *Crocodilus icenicus* (Seeley), a second and larger species of crocodile from the Cambridge Upper Greensand contained in the Woodwardian Museum of the University of Cambridge, by Harry Govier Seeley, F.L.S. 11. On *Macrurosaurus semnus* (Seeley), a long-tailed animal with procœlous vertebræ, from the Cambridge Upper Greensand, preserved in the Woodwardian Museum of the University of Cambridge, by Harry Govier Seeley, F.L.S., F.G.S.

(*To be continued.*)

Geologists' Association, July 7.—Mr. William Carruthers, F.R.S., president, in the chair.—Part ii. of the geology of Brighton, by Mr. Howell.—On the British Palæozoic Arcadæ, by J. Logan Lobley, F.G.S.—It was admitted that any classification of the Lamellibranchiate fossils of the Palæozoic rocks must be liable to considerable subsequent modification since the generic position of many species on account of imperfect preservation cannot be given with certainty. American palæontologists had added largely to our knowledge of Palæozoic Arcadæ, and the recent investigations of Mr. Hicks had extended the known stratigraphical range of this family as well as of the class Lamellibranchiata. The author, objected to the retention in Arcadæ of sinupallial genera, and proposed that these should constitute a new group, the *Ledidæ*. After eliminating several of the generic names which had been employed by authors, the genera allowed to stand were separately described, and the species by which they were represented in British Palæozoic rocks enumerated. The stratigraphical distribution of these species was shown by two tables, with which the paper concluded.

Entomological Society, July 5.—Prof. Westwood, president, in the chair.—Mr. Douglas exhibited some rare British

Psyllidæ taken by himself near Lee, Kent, amongst which was *Aphalara renosa*, Först., new to the British fauna, now first identified as living on *Achillea millefolium*.—The President showed some microscopic slides containing specimens of Diptera, &c., prepared with extraordinary care by Mr. Enock. He also brought for exhibition twigs of horse-chestnut from Oxford, that had been attacked by some kind of larva, which had eaten away the inside of portions of the stem, causing the buds to drop off. He was in doubt whether the insect was *Zeuzera Æsculi*, or some other, but he would be glad to know if the destruction to the trees had been noticed elsewhere. He also exhibited two species of Coccus, one of them on Camellia leaves in his greenhouse which he had previously described in the *Gardener's Chronicle* under the name of *C. Camelliæ*, and which had afterwards been observed by Dr. Verloren in his greenhouse in Holland. The female, which is 1 line in length, discharges a white waxy matter having the appearance of the excrement of a young bird. The other species had been sent to him by the Rev. T. A. Preston, of Marlborough, on a species of Euphorbia obtained from Dr. Hooker, of Kew. The leaves were covered with small scales, to which on close examination he observed two small filaments attached; and these proved to be the caudal extremities of the males. These insects emerge from the pupa backwards, and in consequence they make their appearance with the wings drawn forwards over the head.—Mr. Stevens exhibited varieties of some British Geometræ and what appeared to be a small variety of *Lycæna adonis*, taken near Croydon.—Mr. Baly communicated descriptions of a new genus and of new species of Halticinæ; and Mr. Peter Cameron communicated descriptions of new genera and species of Tenthredinidæ and Siricidæ, chiefly from the East Indies, in the collection of the British Museum.—Part II. of the *Transactions* for 1876 was on the table.

BERLIN

German Chemical Society, June 26.—H. Vohl proved that inosite by fermentation yields ordinary, and not paralactic acid.—W. Möslinger has obtained several octyl-compounds from octylic alcohol (derived from the seed of Heracleum spondylium), viz., octylene, iodide of octyl, octylic and octyl-ethylic ether, octyl-sulphate of barium and mono-octyl phosphine.—H. Brunner and R. Brandenburg have found succinic acid in sour grapes.—E. Klimenko, by treating lactic acid with bromal, has obtained lactid-bromal $C_5H_8Br_2O_3$ identical with the product obtained by acting with bromine on lactic acid.—H. Willgerot has replaced chlorine in dinitro-chlorobenzol by NH_2, by SH and by the residues of aniline and of benzidine.—L. Barth and H. Sennhofer, by treating C_6H_5CN benzonitril with a mixture of oil of vitriol and phosphoric anhydride and afterwards with water, have transformed it into crystals of dibenzamide $(C_7H_5O)_2NH$, the hydrogen of which can be replaced by different metals.—The same chemists have obtained the third isomeric or meta-phenol-sulphurous acid by fusing benzol-disulphurous acid with potash, and interrupting the fusion before both groups SO_3H have been replaced by OK. The result is a potash salt soluble in alcohol—$C_6H_5OK.SO_3K$.—A. Fleischer, in treating diphenyl sulphurea with fuming nitric acid, has obtained tetranitroazoxybenzol—$C_{12}H_6)NO_2)_4N_2O$.—The same chemist described springs containing free sulphuric acid which occur in caverns of the Budos Mountain in Hungary.

July 10.—A. W. Hofmann, president, in the chair.—F. Krafft has transformed iodide of hexyl $C_6H_{13}I$ into perchlorobenzole C_6Cl_6 by treating it with chloride of iodine. The same chemist, conjointly with F. Becker, described the formation of two isomeric dichloro-napthalenes, which, according to these experiments, is always preceded by the formation of an addition product $C_{10}H_8Cl_4$.—V. Merz has transformed a number of aromatic substances into C_6Cl_6 by treatment with ICl_3.—Th. Zöller communicated further researches on the preserving properties of bisulphuret of carbon, and its application for preserving meat, fruit, and vegetables.—E. de Souza described amalgams of the formulæ Na_3Hg, K_2Hg, Au_9Hg, Au_5Hg, $Ag_{13}Hg$, $Ag_{11}Hg$, Ag_4Hg, $Cu_{16}Hg$, $Cu_{14}Hg$, Pb_8Hg.—H. Welde has established the following reaction:—

$$3\left(CS\begin{matrix}OC_2H_5\\SK\end{matrix}\right) + 2CO\begin{matrix}OC_2H_5\\Cl\end{matrix} = 2\left(S\begin{matrix}CSOC_2H_5\\CSOC_2H_5\end{matrix}\right) +$$

Xanthogenate of potassium. Chlorocarbonic ether. Disulphodicarbothionate of ethyl.

$$CO\begin{matrix}OC_2H_5\\OK\end{matrix} + 2KCl.$$

ethylcarbonate of potassium.

Disulphodicarbonate of ethyl forms splendid yellow needles.—C. Böttinger has transformed pyroracemic acid $C_3H_4O_3$ into $C_3H_6SO_3$ thiolactic acid. Dissolved in alcohol and treated with zinc pyroracemic acid $CH_3.CO.CO_2H$, yields dimethyl-tartaric acid $\begin{matrix}CH_3—C(OH)—COOH\\|\\CH_3—C(OH)—COOH\end{matrix}$ forming well crystallised salts with baryta and potassa.—W. Kelbe has treated chloride of phosphorus with mercury-dinaphthyl, obtaining $C_{10}H_7PCl_2$, which with chlorine yields $C_{10}H_7PCl_4$. The latter with water yields naphthylphosphinic acid $C_{10}H_7PO(OH)_2$.—H. Köhler and A. Michælis have dissolved sulphur in phosphenylic chloride, obtaining phosphenylic sulphochloride $C_6H_5PSCl_2$, an oily liquid yielding diatomic ethers with alcohol and phenol.—C. Liebermann showed specimens of Mr. Rosenstiehl's nitro-alizarine and of cotton dyed with this new colouring-matter; its alumina lake is of a deep orange tint.—A. Oppenheim and H. Precht described the following derivatives of dehydracetic acid: a soluble silver-salt, $C_8H_7AgO_4$, its methylic and ethylic ethers fusing at 90°·8 and 91°·6 respectively; its amide, $C_8H_7O_3NH_2$, fusing at 208°·5; its anilide, $C_8H_7O_3NHC_6H_5$, fusing at 115°; monobromodehydracetic and monochlorodehydracetic acids fusing at 134° and 93° respectively. With PCl_5 dehydracetic acid forms the chloride, $C_8H_6O_3Cl_2$, which, heated with water to 180°, regenerates dehydracetic acid. Hydrogen in statu nascendi does not simply unite, but replaces the oxygen of the acid, forming a compound which will form the subject of further investigations.—The same chemists have found that aceto-acetic ether and aniline form alcohol, acetone and diphenyl-urea—

$$CH_3—CO—CH_2—CO_2C_2H_5 + NH_2C_6H_5 = CO(NHC_6H_5)_2 + C_2H_6O + C_3H_6O.$$

—O. Emmerling and A. Oppenheim subjected the same ether to oxidation with permanganate of potassium, which divides its molecule into oxalic and acetic ethers. The same chemists have prepared aceto-acetate of isobutyl, $CH_3.CO.CH.COOC_4H_9$, boiling at 203°. As this substance by distillation yields dehydracetic acid, while with sodium and chloroform it yields oxyuvitic acid, it is fully proved that neither ethyl nor any other alcoholic radical enters into the formation of these acids, which are equally well produced by all aceto-acetic ethers.—Oxyuvitic acid, $C_6H_2(OH)(CH_3)(CO_2H)_2$, has been submitted by the same chemists to the action of nitric acid, which, when diluted, yields hydro-oxybenzoic acid, $C_7H_6O_3$; when concentrated, and particularly when mixed with sulphuric acid, it yields trinitrocresol, $C_6H(OH)(CH_3)(NO_2)_3$, fusing at 106°. With sulphuretted hydrogen, its alcoholic solution yields dinitro-amido-cresol, $C_6H(OH)(CH_3)(NO_2)_2NH_2$, brilliant dark yellow needles, fusing at 156°. With nitrous acid this substance is transformed into dinitro-diazo-dinitro-amido-cresol—

$$C_6H(OH)(CH_3)(NO)_2 - N = N - NH.C_6H(OH)(CH_3)(NO_2)_2,$$

yellow scales, which at 160° decompose with explosive violence.—H. Wichelhaus has studied the action of naphthylamine on nitro-naphthaline, which may be expressed by the equation—$C_{10}H_7NO_2 + 2C_{10}H_7NH_2 = (C_{10}H_6)_3N_2 + NH_3 + H_2O$. The resulting diamine corresponds to violaniline. The same chemist has tried in vain to repeat the synthesis of indigo published by Emmerling and Engler, 120 experiments in test tubes yielding sublimates consisting of zinc and cadmium only.—W. Hill has prepared methylated allantoin, and transformed methylated uric acid into methylated parabanic acid.—T. Murdoch, by heating alloxantin, has transformed it into hydurylic acid.

PARIS

Academy of Sciences, July 10.—Vice-Admiral Paris in the chair.—The following papers were read:—Theorems relating to couples of rectilinear segments having a constant ratio, by M. Chasles.—Philosophy and teaching of mathematics; on the reduction of demonstrations to their most simple and direct form, by M. de Saint-Venant.—On a communication of M. Sacc, entitled "Panification in the United States, and the Properties of Hops as Ferment," by M. Pasteur. He asserts (contrary to M. Sacc), that hop has no influence in raising the dough, and it does not contain a soluble alcoholic ferment. The dough rises because of the development of microscopic organisms; hop may favour or hinder the production of some of these. It gives bread a slight bitterness, which is often liked.—On the carpellary theory according to the Amaryllideæ (fourth part, Narcissus), by

M. Trecul.—Note on the "Study of the Hurricanes of the Southern Hemisphere" of Commandant Bridet (third edition), by M. Faye. The work contains many curious observations on cyclones, but its advocacy of centripetal aspiration is condemned.—New remarks on the question of displacement of spectral lines due to proper motion of the stars, by P. Secchi.—Objections to the last communication of M. Hirn, on the maximum of possible repulsive pressure of the solar rays, by M. Ledieu.—Examination of new methods proposed for finding the position of a ship at sea (continued), by M. Ledieu.—Pliocene man, by M. de Quatrefages. This refers to an Italian work on "Pliocene Man in Tuscany," by M. Capellini.—M. de Lesseps presented a summary report from M. Roudaire on the results of his mission to the isthmus of Gabes and the Tunisian Chotts. These labours have been quite successful, and prove the possibility (M. de Lesseps thinks) of forming an internal lake of 25 to 40 metres in depth, and 400 kilometres in length from east to west, having its entrance at the Gulf of Gabés, and covering a space of about 16,000 square kilometres.—M. Tisserand reported on observations made at Kompira-Yama (near Nagasaki, Japan), during his transit-mission.—M. Favé was elected free member in place of the late M. Seguier.—Experimental researches on magnetic rotatory polarisation (third part). Dispersion of the planes of polarisation of luminous rays of different wave-length, by M. Henri Becquerel. The positive rotations of diamagnetic bodies increase approximately in inverse ratio of the squares of the wave-lengths, the negative rotations of magnetic bodies in inverse ratio of the fourth power of the wave-lengths.—On cellulosic fermentation of cane-sugar, by M. Durin. Cane-sugar is decomposed into equivalent weights of cellulose and coulose, under the influence of a special ferment, which is of diastosic nature.—On the aërial Phylloxera, by M. Boiteau.—On the development of elliptic functions and their powers, by M. André.—Experiments of measurement of velocity (of water in canals) made at Roorke, in British India, by Mr. Allan Cunningham, by M. Bazin.—On the difference of potential in the insulated extremities of an open induction bobbin after rupture of the inducing current, by M. Mouton. He seeks to measure the successive values of these differences of tension, and establish some laws of their variations.—On the reactions of chlorine under the influence of porous carbon, by M. Melsens. A reclamation of priority.—On a new butylic glycol (continued), by M. Milan-Nevalo.—Explanation of the impression ability of the black faces of a radiometer by means of the theory of emission, by M. Biot; note by M. de Fonvielle.—On the crystallisation of sugar, by M. Flourens.—Anatomical characters of the blood in the anæmic (continued), by M. Hayem.—Influence of fatigue on the variations of the electric state of muscles during artificial tetanus, by MM. Morat and Toussaint.—On a remarkable case of reduction of nitric acid and oxidation of acetic acid, with production of alcohol, under the influence of certain microzymes, by M. Bechamp.—Influence of physico-chemical forces on the phenomena of fermentation, by Dr. Bastian.—On a new meteorite that fell on March 25, 1865, at Wisconsin, and whose character is identical with that of the meteorite of Meno, by Mr. Smith.—History of natural wells, by M. Meunier.—Mineralogical notices, by M. Pisani.

July 17.—Vice-Admiral Paris in the chair.—The following papers were read:—On the fermentation of fruits, and on the diffusion of germs of alcoholic yeast, by M. Pasteur.—On M. Durin's note concerning cellulosic fermentation of cane-sugar, by M. Pasteur.—On the alteration of urine, *apropos* of a note by Dr. Bastian, by M. Pasteur. The facts do not prove spontaneous generation, but only that certain germs resist a temperature of 100° in neutral or slightly alkaline media, their envelopes, doubtless, not being penetrated in this case by the water.—On the intercellular generation of alcoholic ferment, by M. Frémy. Fruits placed in an atmosphere of CO_2 or H undergo alcoholic fermentation, and an organic ferment is generated which may cause fermentation of sugar.—Fourth note on electric transmissions through the ground, by M. du Moncel. He compares the currents got from couples made with silex of Heronville and electrodes of zinc, platina, &c, with those of a Daniell.—Examination of new methods for finding the position of a ship at sea (continued), by M. Ledieu.—On the measurement of the electric resistance of liquids by means of the capillary electrometer, by M. Lippmann. One special advantage of this method is that the sensibility does not diminish even when the resistance increases indefinitely. The method is independent of polarisation of electrodes.—On a rock of vegetable origin, by MM. Bureau and Poisson. This was found by M. de l'Isle on the bottom of a grotto in the Island of Réunion; it seemed entirely made up of spores or grains of pollen, probably spores of Polypodeæ.—On the transformation of saccharose into reducing sugar, in the operations of refining, by M. Girard.—Detection and determination of fuchsine and arsenic in wines artificially coloured with fuchsine, by M. Husson.—On a new compensator pendulum, by Mr. Smith. He utilises the dilatability of vulcanite.—On three sand boxes on the savane of Fort-de-France, Martinique, by M. Berenger-Feraud.—On the parthenogenesis of Phylloxera compared with that of other pucerons, by M. Balbiani.—Results obtained at Cognac with sulphocarbonates of sodium and of barium applied to phylloxerised vines, by M. Mouillefert.—Results obtained in using iron pyrites against oïdium, by M. François.—Discovery and observation of Planet 164 at Paris observatory, by MM. Henry.—Observations of the same planet at Marseilles, by M. Stephan.—On the circumstances of production of two varieties of sulphur, prismatic and octahedric, by M. Gernez.—Critical researches on certain methods employed for determination of the densities of vapour, and consequences that are drawn from them; by MM. Troost and Hautefeuille.—Action of hydracids on selenious acid, by M. Ditte.—Observations on iodine as reagent for starch, by M. Puchot. Its sensibility is at fault in presence of certain azotised organic matter, such as albumen.—On rhodine, a new reaction of aniline, by M. Jacquemin.—Study of the action of water on glycols, by M. Milan-Nevalo.—On the existence, in Spain, of a bed of nickel ores similar to those of New Caledonia, by M. Meissonnier. This is in Malaga. The first works of exploration recently commenced, have furnished several hundreds of tons.—Anatomical characters of blood in the anæmic; third note by M. Hayem. The weakening of colour and the failure of agreement between this colouring power and the number of coloured elements are the two essential characters of anæmia.—On some phenomena produced by faradisation of the grey matter of the brain, by M. Bochefontaine. If it be admitted that there are motor centres of the limbs in the grey substance, yet the same stimulation (which causes limb-motion) puts in action the muscles of organic life and the glands. But the facts do not prove the cortical substance excitable by faradic currents; the stimulation probably affects the subjacent white matter.—Cutaneous respiration of frogs with regard to the influence of light, by M. Tubini. Frogs deprived of their lungs excrete CO_2 in darkness and in light, in quantities having the proportion 100:134.—On disease of the ox through the inermous tænia of man, by MM. Masse and Pourquier. The rabbit, dog, and sheep are not a favourable soil for development of this tænia, but the ox is.—On vesical microzymes as cause of the ammoniacal fermentation of urine, by M. Bechamp.—On meteoric iron, by M. Yung.—On a vertical column seen above the sun, by M. Penou.—On traces of the presence of man in grottoes in various parts of Provence, by M. Jaubert.

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